APR 16 1935

ELECTRICAL WORLD

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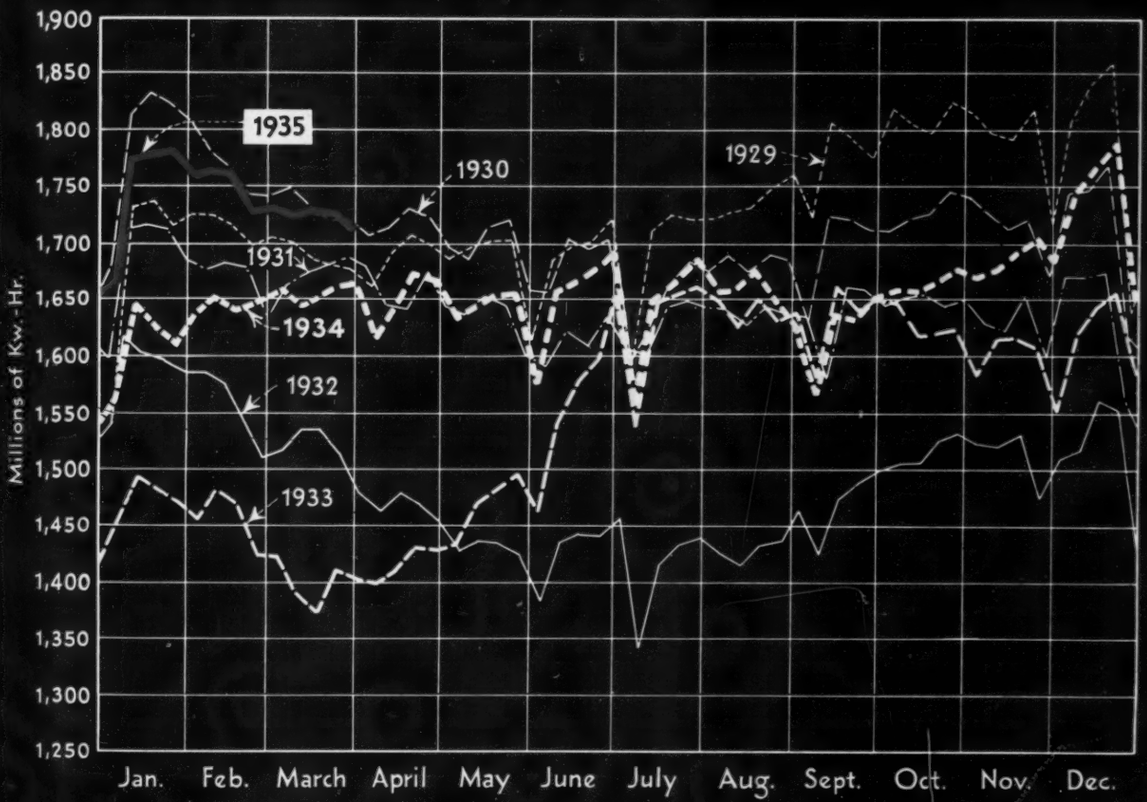

Weekly output of central stations has reached the highest level ever attained for this season of the year and next winter's peak may well break all records. Domestic energy use is on a higher level than ever before. Industrial consumption, up 40 per cent compared with the early part of 1933, has a strong rising trend. Future needs are today's plans.

APRIL 13, 1935

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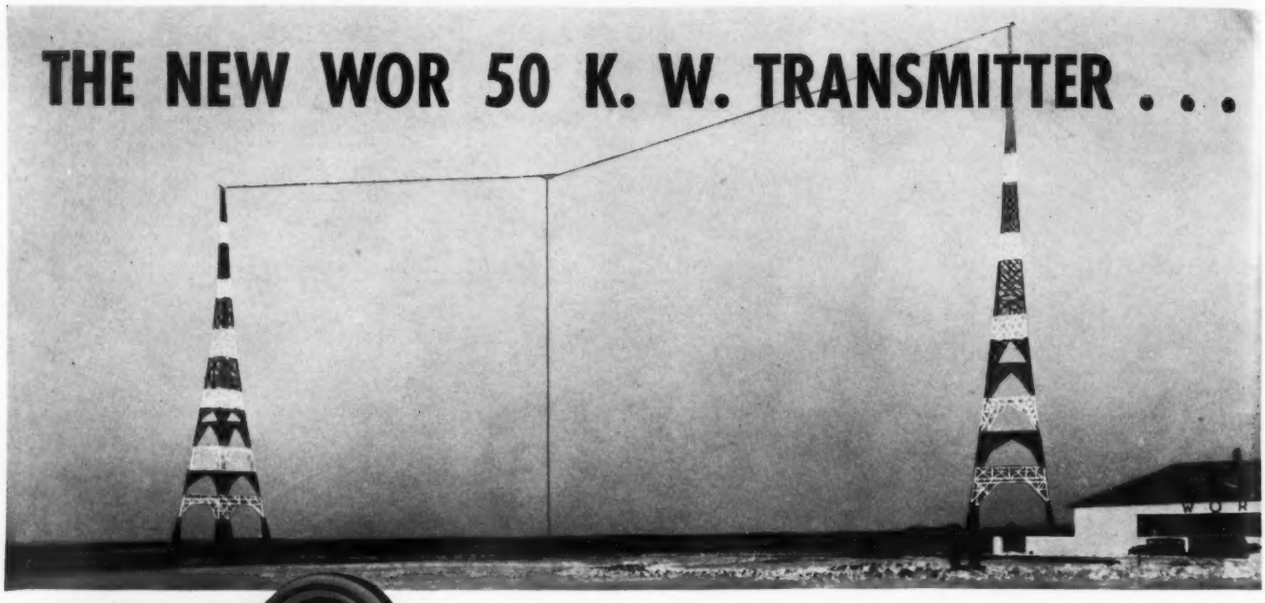

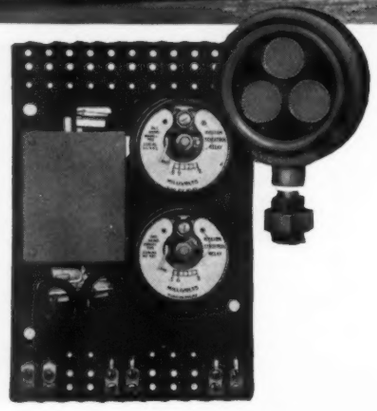

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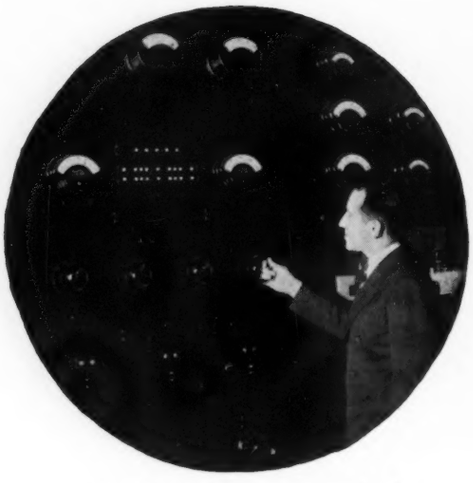
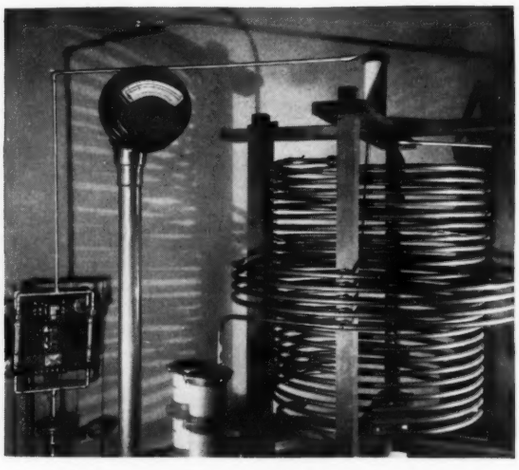


As in all carefully engineered jobs, standard Weston electrical indicating instruments are used in this new station.



A specially mounted Weston high frequency ammeter measures this new station's high output current as it leaves the transmitter building. At lower left is seen the nitrogen-filled tube through which the concentric transmission line runs underground for 600 feet to the antenna system.

Weston Electrical Instrument Corporation, 578 Frelinghuysen Avenue, Newark, N. J.

WESTON *Instruments*

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THIS INDEX is merely a convenient guide. Many articles will appeal to several reader groups—many will apply to all. News and other departments are of general interest.

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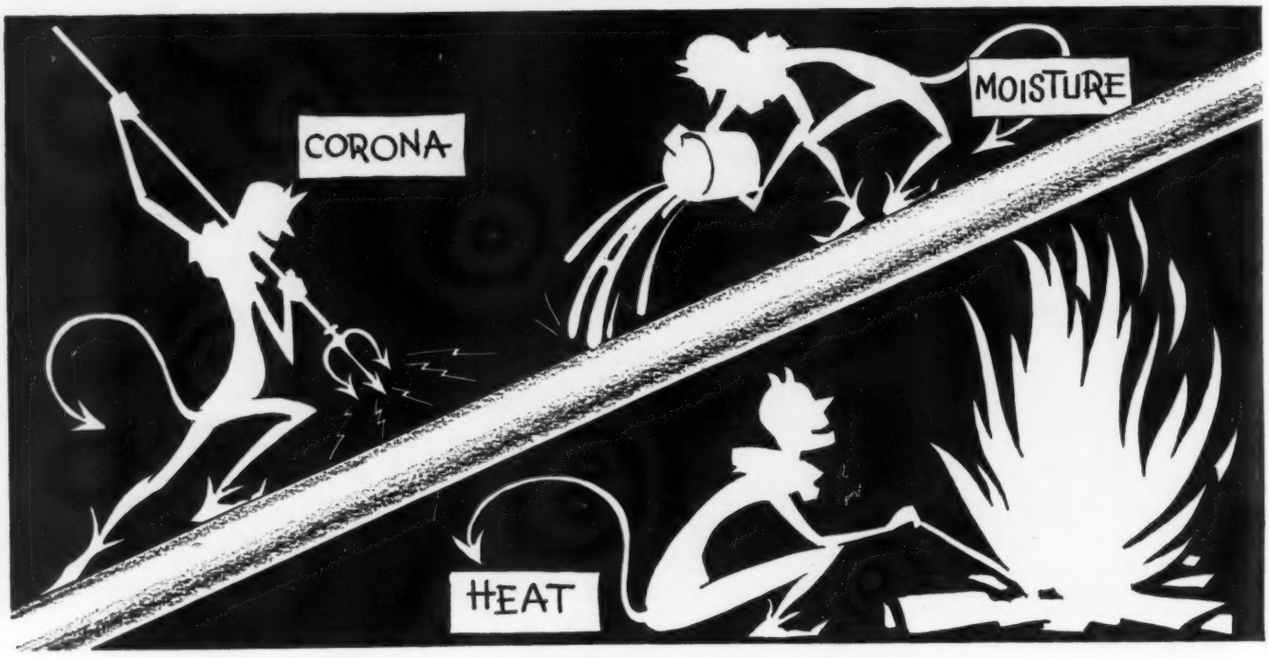

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. . . *Trends* . . .

As Gleaned from this Issue of "Electrical World"

▸▸Recovery Still the Issue

If official Washington still thinks the electrical industry does not deserve better treatment than it has been getting it is just too bad. We did our level best to set Congress and the Administration straight. Seven hundred copies of the March 30 Recovery Number of ELECTRICAL WORLD were delivered by messenger to the members of Congress and the commissions regulating the utilities in one way or another. As many more went to state offices around the country. Scores of letters acknowledge receipt and many indicate they welcomed the portrayal of the recovery asset which lies hidden in electrical markets. One Congressman confidently says the holding company bill will not emerge from the Rayburn committee this session. If we do not guess awry the case for the industry has been so well put by the executives in the hearings and in our "monumental piece of work" (as one commentator calls it) that Congress is going to pause before it dismembers an industry in defiance of the multitude of investors who bombarded its members by wire and mail. That was a "telling" barrage.

▸▸Rayburn Bill Far Overshoots

An explosive individual intent on avoiding profanity runs out of vocabulary when he contemplates that Rayburn-Wheeler bill. Vivisected, drawn and quartered, guillotined, garroted, pilloried, crucified. Any one is insufficient to define what the enemies would do to the holding companies and their wards if they had this bill to fortify them. Amputation at the neck for the sake of a corn would be as sensible and humanitarian as what the impractical theorists have woven into this bill just to prevent a recurrence of some errors of a gone era. We predict there will be good holding companies for many years, that they will be regulated, and by existing boards in the states and in Washington. The Willkie and Porter principles are what should guide the amendments to existing laws to cover the needs adequately. The public interest calls for regulation of the holding company in the interest of the investor as it calls for regulation of the operating company in the interest of the consumer.

▸▸Not How Little, But How Soon?

Regarding the prospect of early need of extensive new construction, there can no longer be serious doubt. The only question on which opinions may differ is, "How soon?" To that question no general answer is possible because it depends on local conditions. Monthly operating statistics of the electric light and power industry appearing in this issue do, however, indicate a very definite upward trend in the demand for energy, now close to the pre-depression level. Domestic use is greater than ever before. Next winter's peak may confidently be expected to be still higher. Industrial consumption is definitely on the increase. A 40 per cent rise in two years is no trifling matter. The abnormally small midwinter sag is another indicator of progress. Meanwhile, the weekly reports of energy production, bringing the statistical evidence into the current month, show operations actually matching those of 1930. Restoration of load has been largely achieved and further progress is virtually assured. Restoration of normal returns on investments is still to be attained.

▸▸Keys for Interlocks

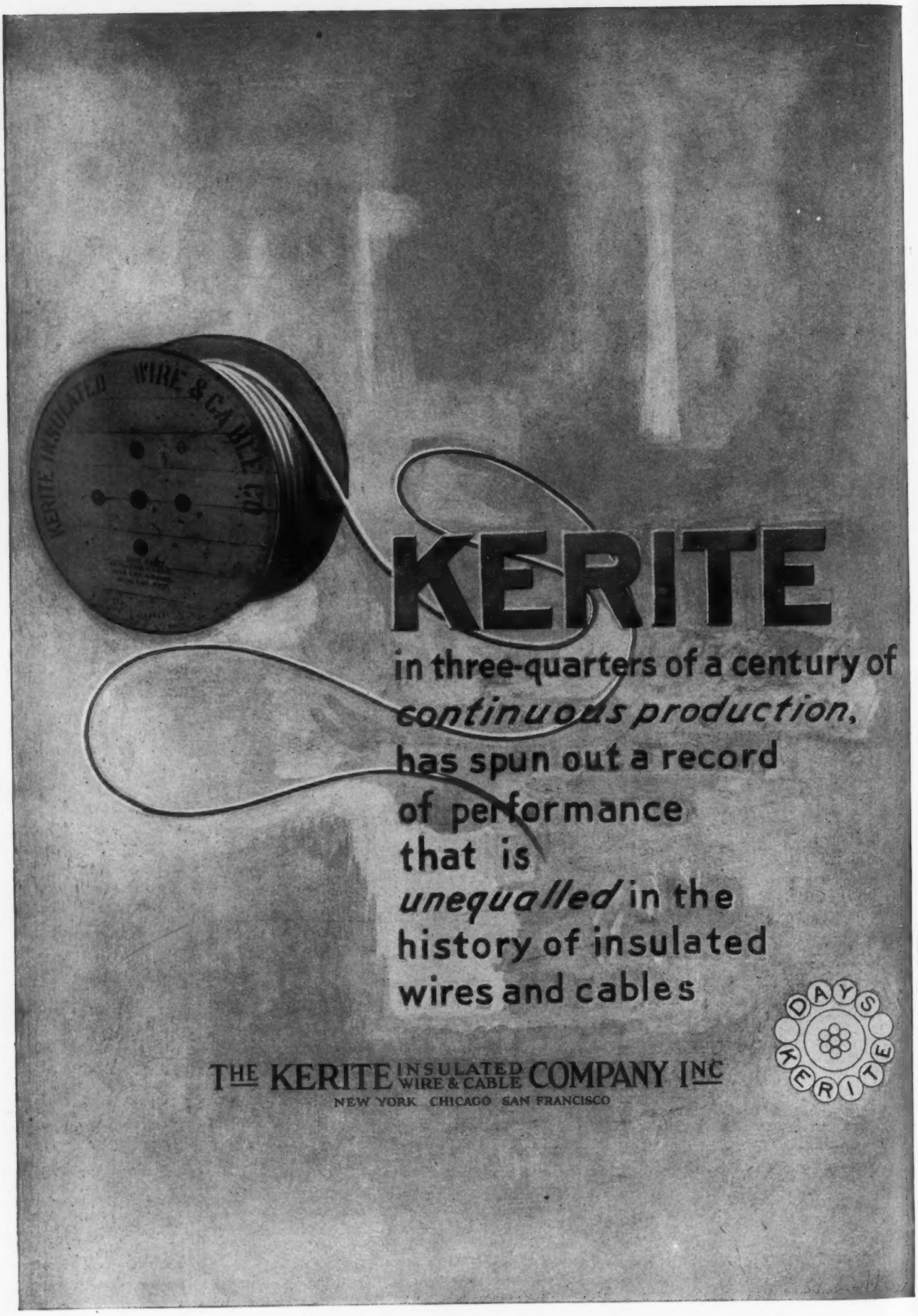
If one had asked years ago "where is the key for the interlock" the rejoinder would probably have been "it's hanging alongside the left-hand monkey wrench." But the facetiousness no longer fits after one reads R. H. Long's discussion of the Kirk interlock as used on the Duquesne Light system. It uses keys and in such a way that the key becomes an integral element of the interlock function. When the key is in one place it can't very well be in another at the same time. Some former railway men will recollect the "staff" system of dispatching

▸▸That Surplus Capacity Myth

Do we need more generating capacity or don't we? or, rather, shall we? The Power Survey group of the Federal Power Commission says we should put draughtsmen to work at once on 50 plants because we are potentially 4,000,000 kw. behind. Several utility executives promptly told the world we would do well to use up the 20 per cent margin we now have before waxing so optimistic. While this is being written another engineer phones to say he has just satisfied himself that the excess is 38 per cent. Alfred Iddles in this issue says there may be systems in which additional capacity will be required within the next few years. You take your choice. The fact is that it all goes back to Einstein and relativity. All the conflict can be reconciled if the case is stated thus —if what we now have is subjected in the early future to a load like that we used to know the current difference then will be more of a shortage then than it is an excess now. Can it be that the bureaucrats, in their optimism, are trying to make out a case for the St. Lawrence project?

▸▸What Kind of New Capacity?

Let's assume the argument is all settled, that the F.P.C. is right and that there will have to be some new capacity. What will this be—brand new base-load plants of high efficiency, cheap and relatively inefficient peak-load plants, remodeled plants for either purpose, or existing plants supplemented by new units? There is also a question of size, of power concentration, of transmission distance and of service continuity. Authentic thinking on this is imperative right now because the situation may change abruptly so as to justify additions to capacity. That's why you find so timely an article as that of Iddles' on planning new capacity in this issue. We even let him run over his allotted three pages to have his say. Read it and decide what you would have cut out if you had been the cold-blooded blue penciler.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MANAGEMENT • ENGINEERING • OPERATION • UTILIZATION

PUBLISHED EVERY OTHER SATURDAY

APRIL 13, 1935

Renascence in Power

UNLESS all signs fail the electrical business of this country is overriding its greatest obstacle and the barriers ahead are going to be mere hurdles to be taken in stride. It is reassuring to learn that there is too much sanity in Washington to accept the Wheeler-Rayburn bill. On behalf of the industry the spokesmen have made a compelling presentation against the obliteration and shackling that it would have thrust upon power in this country. It has been encouraging to see such unanimity develop in the crisis. On receiving the March 30 Recovery Number of ELECTRICAL WORLD some of the Congressmen write us they will not support so drastic a raid on the innocent investor. Several flatly prophesy the bill will not emerge from the committee during this session.

Let's hope it never emerges, but that in its place will come forth legislation embodying the holding company regulation proposed by Messrs. Willkie and Porter. With clean hands, they and Jones and others have laid a clean-cut program on the table before the committee. Enacted, it would set up no new bureaus. It would merely stiffen existing legislation, it would preserve the province of state regulation, it would preserve the local operating character of the industry, it would recognize the national character of its financing. It would deprive government ownership devotees of a nefarious implement to hornswoggle the nation into the labyrinth.

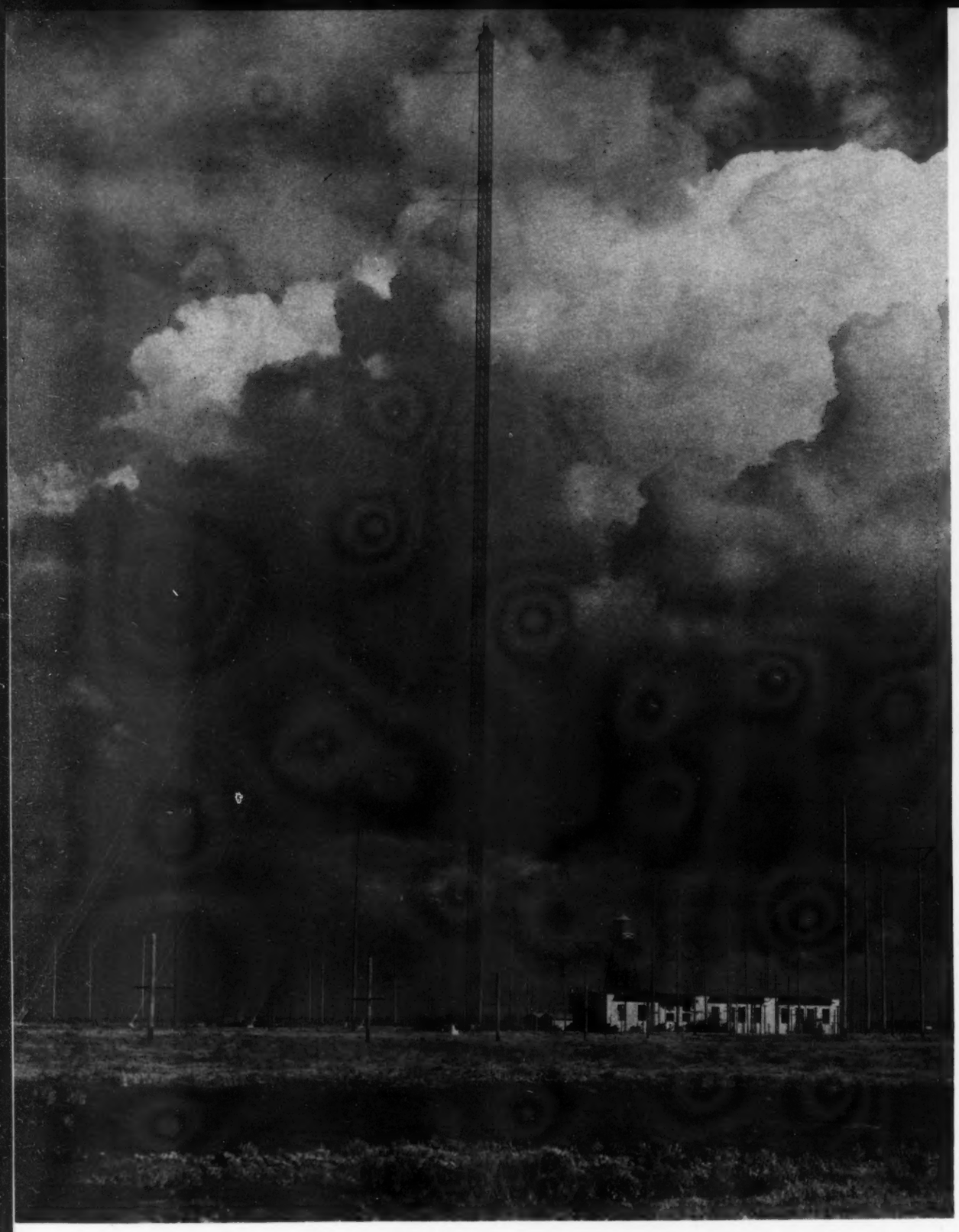
It is inconceivable that the candid testimony of the executives before the Rayburn committee will leave Congress doing the blind bidding of the rampant destroyers who connived on this bill. The prospects are that the ultimate regulation will be far less restrictive than was schemed. If the framers figured there were no holding companies that could stand up like men and justify their existence and their ethics, they must now be both milder and wiser. If the framers figured the whole industry would lie back and not register its united protest in a journalistic presentation that proved the good that could be done for recovery by a governmental right-about face with respect to electricity policy they must have been jolted.

Meanwhile, two other episodes clinch the belief that the power scene is shifting favorably. The Power Survey report has started trickling out. First installment says we face a power crisis —need 50 plants for 4,000,000 kw. right away. Of course there is a surplus nearly everywhere now and the government is only making matters worse and in the wrong areas. Possibly the Federal Power Commission's power survey prediction is expected to help out the St. Lawrence scheme, but whatever the motivation, the effect is a bullish confirmation of those who have dared to say consistently that "surplus capacity is a myth." Those who take that stand dare to face both the known present facts and the certain future.

Another episode of the fortnight was the discomfiture Director Lilienthal must have felt when he had to admit before the Rayburn committee that his T.V.A. is being accorded some very life-saving benefits not available to private enterprise. It was not a particularly happy spot to have to place these acknowledgments on the record. His admissions about escaping a dozen kinds of taxation, about preferential freight rates and about preferential interest rates quickly traveled by ticker in terms which restored some of the battered down prestige of utility securities.

Communal power is on the defensive. Private power enterprise has made a masterly case, not only for its preservation but for its right to sympathetic co-operation from government. It has been frank to admit the need for added regulation. There is no spark of dissension. There was complete unanimity in staving off annihilation. Therein is a nucleus for unity in the next moves, moves for recovery.

An end of dark ages appears in sight. A renascence in power is portended by recent events.



DIRECT COMMUNICATION WITH CHINA AND JAPAN is provided by the 50-kw. transmitters at this station of the Mackay Radio & Telegraph Company, located near San Francisco, Calif. Its equipment, including the 626-ft. steel mast and smaller directional antenna, is typical of the rapid advancement of the communication industry in expanding to meet the needs of modern civilization

Planning New Capacity

Design and construction of power plant capacity are still problems which involve many variable elements. Most important are the local construction conditions and the geographical position in relation to system load centers. No simple formula can be used to determine the proper method for solving these problems. The most likely solution, at the present time, is to utilize existing generating-station buildings and electrical facilities by remodeling the older and less efficient elements. This can be done by changes in various parts of the plant, but the most promising method is to superimpose high-pressure units upon the old plants, thereby increasing their efficiency and prolonging their useful life.

By ALFRED IDDLES

Vice-President
United Engineers & Constructors, Inc.,
Philadelphia

DURING the past five years utility companies throughout the United States have done very little work in extending their generating capacity or rehabilitating their existing plants. Reduction in loads has permitted the systems to continue with existing capacity and there has been very little encouragement toward the consideration of new plant capacity or major changes in existing facilities.

Today, however, there are territories which are facing the question of how to meet the increased fuel costs by improvement in existing plants. And there may be systems in which additional capacity will be required within the next few years. Plants which were obsolete five years ago are even more so at the present time.

Quite probably the constant urge to lower production costs will force many companies to a consideration of how best to handle their problems of plant extension or rehabilitation.

The foregoing situations lead to the general questions of how shall additional or improved power plant capacity be provided and what are the principles which should govern the design. In general, there are at least four ways in which additional capacity can be secured.

1. Construct new base-load plants.
2. Construct cheap and relatively inefficient plants for use on the peak-load portion of the load curve.
3. Remodel existing plants either for additional capacity or better operation, or both.
4. Add capacity to old plants by superimposing high-pressure units on existing equipment.

Design of additions to the system generating facilities should be based upon a study of the general trend of the cost of capital and fuel and upon a careful analysis of economic and service requirements for power supply for the entire territory under consideration.

The economic distance for electric transmission can be measured in dollars. In most territories this distance has decreased steadily in the past ten years, and it seems likely that this trend will continue. Only unforeseen inventions or cost changes will alter the present conclusion—the production of power in a limited number of large stations and transmission over considerable distances to the load centers do not constitute the correct solution of the power-supply problem.

Transmission distances low

Cost of transmission, including the necessary substations, service requirements, and frequently power-factor correction apparatus, strongly points to the desirability of locating the generating capacity as close as possible to the load centers. This moves the transmission line into the rôle of supplying a means for taking advantage of diversity between load centers and for emergency tie connections between multiple generating plants. Diversity between load and reserve capacity may be considerable between load centers or between different companies in adjacent territory.

Wherever hydro-electric capacity is or can be made available, this principle is subject to alteration in order to make the hydro available in cooperation with steam stations at or near the load centers. Such opportunities, however, are isolated and do not affect the general trend, which is definitely toward the use of multiple stations near the load centers, with transmission limited to distances of the order of 50 or 100 miles.

Base-Load Plants—To justify a base-load station it should be possible to assign it to a portion of the system load curve where it can be operated at a capacity factor considerably higher than the system load factor. Its size and geographic relationship to available, less-efficient steam plants or to hydro plants will determine its capacity factor. Careful study of the probable system growth should be made in order to estimate the capacity factor which this base-load station may expect, not only during the first five years of its life, but also throughout its useful life. Such a study will materially assist in choosing the relative efficiency and reliability which should be built into the new base-load station.

If the proposed station is to operate on a system with hydro-power, then due regard must be given to the pondage already in existence and to the possible additional storage in the future. These conditions will indicate the portion of the system load curve on which the hydro should operate. Usually if a hydro is used as a peak-load station for a portion of the year, it nevertheless must be used on the

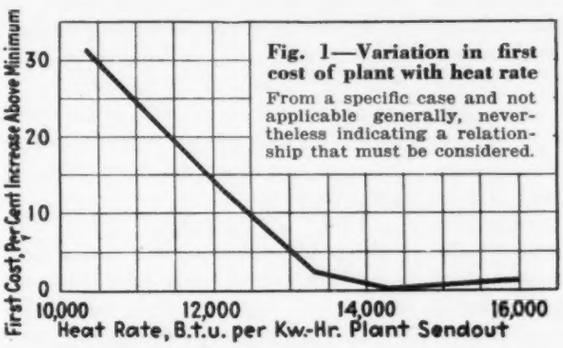


Fig. 1—Variation in first cost of plant with heat rate
From a specific case and not applicable generally, nevertheless indicating a relationship that must be considered.

base of the load curve during the high-water period. Such use relegates the otherwise base-load steam plants to a less advantageous position on the load curve for several months during this period. The total annual capacity of a base-load steam station, therefore, may be affected materially by the characteristics of the hydro plant.

The extent to which the steam plant should be designed for high efficiency will depend not only upon its position on the load curve, but also upon the fuel cost in the particular territory. While no general statement is applicable to more than a few instances, nevertheless it is interesting to observe the relationship between additional capital cost and increased efficiency in a specific instance. Fig. 1 shows a relatively flat curve for a portion of the efficiency range. There are several items of equipment and certain alternate cycles now available to central-station designers which will increase station efficiency and return an excellent percentage on the capital cost.

In determining the reliability of such a base-load station its size, relationship to its own load and the character and type of connections with other plants must be given careful consideration. Also, any such plant, remote from its load, must have the cost and the reliability of the transmission lines applied to the same factors for the base-load plant in order to compare it with any alternative scheme.

Another variable entering into the problem of choosing the size and location of base-load plants is the relationship between the size of the units and the capital cost of the plant. Such a relationship, based upon a study of many actual and estimated costs of specific plants, is shown in Fig. 2.

Recently there has been considerable discussion of co-operation between industrial plants and central stations to supply both steam and electric service to the former. Many industrial plants which have a combined requirement for steam and power are of a nature which requires a high capacity factor. Such combination plants, of course, would not be of much moment in the large metropolitan systems, but it is entirely possible that for small central-station systems such combination plants could be constructed to the advantage of both parties. Such plants would be in the nature of base-load stations and their existence in the present or possible future should be considered in any calculations for new base-load system capacity.

Peak-Load Plants—The use of hydro-electric plants for peak load was mentioned in so far as it might affect the desirability of base-load plant construction. The effect of different load-curve shapes upon the amount of hydro-electric capacity which can be considered as "firm" is illustrated in Fig. 3.

If there is a reasonable amount of storage for the hydro installation, then it usually can care for the peak load.

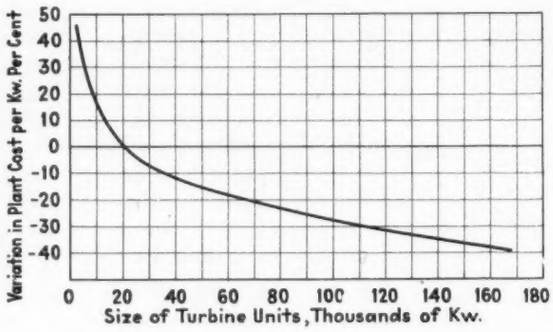


Fig. 2—Variation in first cost of plant with size of turbine units

Compiled from actual cost data. The cost data used in plotting this curve were adjusted for differences in design and local conditions. The rapid decrease of cost per kilowatt with increased size of units is due not only to the lesser unit costs for the machinery items but also to the much smaller building and land area required per unit of capacity. For systems where units of 75,000 kw. and larger are possible, the use of such sizes and a simplification of design are the two principal means of accomplishing a reduction in the fixed capital charges entering into the production cost of power.

When this condition exists it is ordinarily uneconomical ever to construct new steam capacity specifically for peak-load requirements.

On small systems the use of Diesel engines for peak-load stations has been successful in some instances. They have the advantage of quick starting and require only a small number of attendants. Where fuel conditions are favorable and where the Diesel plants can be located advantageously in the system distribution scheme, such Diesel plants have proved successful for peak-load requirements. However, they are scarcely ever useful as substitutes for old but reasonably reliable and moderately efficient steam plants already in existence.

Another consideration for small companies should be the possibility of utilizing industrial plants either by purchase or lease, arranging for the normal load to be carried by the system, but for the industrial plant to be started up to carry the yearly peak load. This, of course, is just a variant from the use of an old steam plant for peak capacity.

Nearly all systems utilize their older steam plants on the annual peak load. When so used their low efficiency and high operating cost are of little consequence because of the short time during which they are operated during any one year. If an old steam plant has a reasonable maintenance cost, then the fuel cost for the very low annual load factor is of practically no consequence.

In considering old plants for peak loads it is advisable to divide their operating costs into two elements: First, the *fixed operating cost,* which is made up of labor and maintenance, and similar items which will exist whether the plant is operated or not. This item should also include fuel for banking purposes if the plant is kept hot and ready for service. The second element is the *variable operating cost,* which depends upon the amount of energy produced.

For instance, in a modern steam plant the fixed operating cost in one specific case is $3.50 per kilowatt per year, which includes all non-variable operating costs. The operating costs which vary with the load total 2.10 mills per kilowatt-hour. In comparison are typical figures for a plant between fifteen and twenty years old, which is now in use for peak-load purposes only. The fixed operating costs are $6.36 per kilowatt per year and the operating cost is 3.79 mills per kilowatt-hour. In still another instance an older plant, less advantageously constructed for present-day conditions, has corresponding costs of $11.44 per kilowatt per year and 4.12 mills per kilowatt-hour. In this case the fixed operating cost is very high, because of the large number of units of small size and the large amount of maintenance and labor for upkeep and watching when not in service. This plant is not nearly so advantageous for peak-load service as the preceding one, because of the large size of the fixed component of operation.

Remodel Existing Plants—Whether

an existing plant can be remodeled advantageously will depend on several factors: Is it worn out or is its usefulness in question because of low efficiency? If parts, such as boilers, have reached the end of their useful life, then presumably the investment can be written off and the plant remodeled by adding new equipment in part. The new equipment can be of improved design and greater efficiency. However, if the plant is not worn out, then a more difficult problem is encountered—determining the capital expenditure which will be justified by an increase in efficiency or capacity, or both.

Another consideration is whether the station is located in the midst of a territory with a dense load. In other words, should the capacity be added in the middle of the load area in an old plant or is the load growth of the system in other portions? The cost of transmission from the new capacity, whether the power is imported from another plant or from additional capacity in an old plant, must be added to the plant cost to determine the true charges against the production of power at the load center.

In many of the larger systems plans were made at one time for the construction of large base-load plants with the intention of supplying the load in their immediate territory and connecting them with the main system through transmission, in order to profit by the additional efficiency of the more modern staiton. However, the loads have not always developed geographically in the manner contemplated when these stations were planned. In several instances the scheme of development has been changed radically in the past few years. Sometimes congestion in city streets made ample interconnection of these stations so difficult and expensive that it was found more profitable to operate the older stations on the load curve of their own territory. In other cases the trend of load growth has been altered so greatly that new sites have been chosen and new plants undertaken before the assumed capacity of the previously planned plants has been fully developed.

There is one instance where development of a plant has been slowed up so that only one-sixth of its contemplated capacity is now installed and present plans call for a permanent maximum capacity of one-third. In the meantime a new site has been chosen and a new plant projected to care for the load growth in its own surrounding territory. In this case the change in plan was caused by the changed load conditions, the cost of transmission and the desire to minimize the dependence upon the vulnerable transmission line.

One large utility system in the United States has followed for years the policy of locating several medium-sized but equally efficient plants in different portions of its territory, each supplying its own load in general and with only relatively loose and small interconnections.

There are many examples throughout the country of remodeling of old plants either by the erection of new units in old buildings or by the improvement of certain portions of the cycle by the addition of air heaters or water-cooled furnace walls, or by other changes. A few specific examples of the advantages gained by remodeling old plants will illustrate the range of possibilities.

In one station four stoker-fired boilers were installed supplying 20,000 kw. of turbine capacity. The building was constructed for duplication both in the boiler and the turbine rooms. Two years later the second unit was installed (a thirty instead of a twenty) and the same building space was supplied with four stoker-fired boilers with water-cooled walls. The stokers are longer and of an improved type, supplied with preheated air. By these changes 30,000 kw. has been accommodated in the space originally planned for 20,000 kw., with no decrease in thermal efficiency but with a great improvement in dollar efficiency.

Another station has boilers, each with 34,000 sq.ft. of heating surface and served by stokers which limit the station capacity to a certain maximum amount of steam per hour. One of these has been changed recently to an improved type of stoker with an increase of 23 per cent of fuel-burning area. The capacity has been increased 45 per cent.

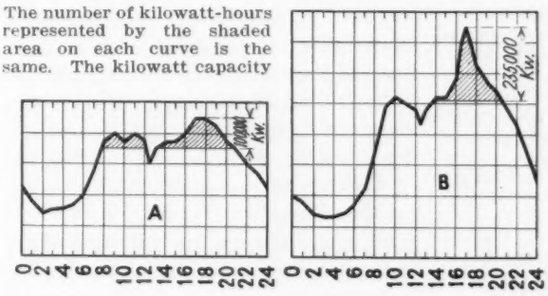
A station built some fifteen years ago with the then usual type of stoker-fired furnace had all of the boilers changed by the addition of about 3 per cent of water-cooled walls in the side and rear. This increased the capacity of the boiler plant by 20 per cent and made it possible to install an additional turbine, thereby increasing the station capacity and at the same time decreasing the maintenance cost of the boiler equipment.

Another twenty-year-old central station has been remodeled by the elimination of old turbines, but the old generators and electrical equipment have been continued in use. The boiler plant has been changed by partial removal of old boilers and installation of new ones with higher pressure. This is an excellent example of remodeling, since practically all of the old building, the electrical apparatus, condensers and many of the turbine parts of the older plant have been continued in service.

Superimposed Plants—Use of high-pressure turbine units exhausting into present lower pressure turbines is a special method of remodeling of old plants and is a development which is just now very actively under consideration by a number of companies. The major variables in this problem are the size of the existing units and the pressure at which they are operated. If a plant is operating now in the neighborhood of 200 lb. and 600 deg. F., then there is much more to be gained by the addition of a high-pressure unit exhausting into these old turbines than there is when the old units are, say, 400 lb. and 700 deg. F.

If the new unit of high pressure which properly can be superimposed on the old units is relatively small, say, 5,000 or 10,000 kw., then the unit cost of this new capacity may be very high. The gain in efficiency would not be enough to warrant the expenditure, compared with that for installing another unit of the same pressure and temperature as the existing ones. On the other hand, if 15,000, 25,000 or 50,000-kw. high-pressure units can be installed exhausting into the old turbines.

Fig. 3—Applicability of firm hydro power dependent on shape of load curve



The number of kilowatt-hours represented by the shaded area on each curve is the same. The kilowatt capacity required to supply this portion of the load curve varies materially in the two systems. In the case of system "A" the peak-load capacity of the hydro-electric is only 100,000 kw., whereas for system "B" the peak load capacity is 235,000 kw. The same amount of available energy in the water is capable of producing a much greater capacity and therefore warrants the installation of a greater ratio of hydraulic turbo-generators to water available than in the case of system "A." Likewise, the hydro plant operating on the load of system "B" replaces a much larger amount of steam capacity and therefore is worth much more than would be the case if the hydro plant were compelled to operate on a less advantageous load curve, such as indicated by "A." In other words, where a load curve exists such as in "B" a hydro plant has more value than for a system such as "A."

particularly if the pressure is in the neighborhood of 200 to 250 lb., then the low cost per kilowatt of new capacity plus the increased efficiency of the station as a whole nearly always will warrant the choice of this plan.

Any such plan for superimposing high-pressure units must always be compared, first, with an entirely new plant operating at the same high pressure and, second, with a new plant of moderate pressure but simple and inexpensive design. The local construction conditions, as well as the load factor and the cost of fuel, frequently will be the deciding factors in comparing these two methods of either improving efficiency or increasing capacity, or both.

In one recent study it was found that the construction conditions, particularly the difficult foundation problems, caused the superimposed high-pressure unit layout to be much cheaper than a new plant on a new site. Also, there was the advantage of transmission and distribution already in existence. Incidentally, this plant recently had remodeled its boiler room so that there was excess old boiler capacity. The removal of this excess left space for new high-pressure boilers and the result was additional capacity at much less unit cost than was possible by any other method. Also, the efficiency of the old station was improved.

In another system, where fuel is relatively cheap, it was found that a 1,200-lb. plant of 25,000 to 35,000-kw. size could be superimposed upon older units, with a very favorable cost per kilowatt of new capacity. The savings due to the increased efficiency would pay the fixed charges on approximately two-thirds of the new capital and only the remainder was chargeable to the additional capacity.

In still another system, where steam plants are primarily used as standby for hydro-electric power, a study indicated that to superimpose a 1,200-lb., 900-deg. F. unit on old 200-lb. turbines would result in such expense that it was not feasible to make the change unless the capacity factor could be assumed as greater than 25 per cent. With a lesser capacity factor, it would be cheaper to install a simple 400-lb. plant to be used for peak capacity.

Various recent studies in a small system where unit sizes of from 10,000 to 15,000 kw. are the rule indicated that no superimposed high-pressure units were warranted for efficiency gain only. If new capacity were required, then such design would be slightly better than to construct a continuation of the present plant in 300-lb. units. Specifically, the superimposing of a 1,200-lb., 900-deg. F., 10,000-kw. unit on old 300-lb., 700-deg. F. units, replacing the old boilers with new, would cost approximately 50 per cent more than for a new 15,000-kw., 300-lb. unit. The high-pressure unit would improve the entire station efficiency, but the load factor, the cost of coal and the policy of minimizing investment costs led to the selection of the continuation of the 300-lb. plant.

This scheme of using a high-pressure unit exhausting into older machines, inevitably, is dependent upon many elements. It permits adding both to capacity and efficiency of old stations.

The Economy

By M. E. SKINNER
Assistant Vice-President
Niagara Hudson Power Corporation

THE recent entry of the federal government into the business of financing time sales of electric appliances through the Electric Home and Farm Authority has created a lot of interest in the subject. It has become increasingly apparent during the past few years that customers' inability to finance the purchase of appliances is a greater bar to complete home electrification than are the charges for the electricity to operate them.

This problem assumes a major importance in any situation, but particularly is this the case where the utility does not itself sell merchandise. Accordingly, when the Niagara Hudson group of companies discontinued the sale of appliances, early in 1933, it was clearly recognized that a better finance plan for dealers would be absolutely necessary if a satisfactory volume of sales were to be maintained.

Some utility companies had solved this problem by arranging to carry time-payment contracts for dealers and this possibility was naturally considered. However, a careful analysis of the situation indicated that there were some disadvantages to the company in this method of operation, and it was determined to seek some other solution. Specifically, the company wished to:

1. Avoid the necessity of employing its own funds.
2. Avoid the responsibilities incident to passing on merchandise credits.
3. Escape from the necessity of serving as a collector (never popular) of other people's bills.
4. Avoid the responsibility of guaranteeing dealer accounts.

Several of the nationally known financing institutions were approached, and while they were interested, their experience with this particular type of business was so limited that they were very reluctant to depart from precedent established through motor vehicle financing.

Several possibilities were finally suggested, and Niagara Hudson companies offered to serve as an experimental laboratory in order to check the various ideas in actual field operation. In this way the finance company could satisfy itself before making commitments on a national scale.

Commercial Credit Company evidenced willingness to try out some of these new ideas, and out of an extended series of conferences came the so-called "Economy Purchase Plan." This plan was tried experimentally in the city of Buffalo for more than a year before it was made available in other localities. The results of its operation have been satisfactory to all interested parties, and it is believed that the plan offers the first real contribution to the solution of this problem.

When the Electric Home and Farm Authority was setting up its program for financing dealer sales in the Tennessee Valley it was given full information in regard to the Economy Purchase Plan. In the following description the reader will recognize many points of similarity between these two plans. Naturally, Economy Purchase Plan rates cannot be quite so low as under a plan where government funds are used at abnormally low rates of interest.

Co-operation brings savings

The Economy Purchase Plan is entirely co-operative, benefiting all con-

Purchase Plan

Niagara Hudson Finds an Answer to the Time-Payment Finance Problem

cerned in the transaction. The following breakdown of functions illustrates how each contributes to the program:

Purchaser

Undertakes to pay installments promptly.
Agrees that if slow or delinquent will pay something toward the extra costs of handling.
Agrees to a firm collection procedure which will eliminate delinquencies of more than 30 days.

Retailer

Undertakes to see that details of plan are understood by purchaser.
Undertakes to secure basic credit information.
Agrees to assist in collection effort if delinquencies develop.
Agrees to repossess the appliance and repurchase the account upon notice from finance company.

Utility Company

Undertakes to call the merits of the plan to the attention of all dealers.
Assists in training dealers and dealers' salesmen in handling details of plan.
Makes available to finance company:
1. Local office space, office equipment and telephone facilities.
2. Access to means of quickly checking credit information.
3. Machine accounting facilities for setting up records and preparing bills.
4. All facilities for receiving payments including branch offices.
Prepares and sends all statements of installments due.
Prepares and sends past due notices.
Recenves payments made within twenty days of due date.
Makes up monthly statements of volume of paper purchased, classified as to manufacturer.
Makes up annual statement of amounts outstanding, classified as to manufacturer.

Manufacturer

Undertakes to call the merits of the plan to attention of all dealers.
Assists in training dealers and dealers' salesmen in handling details of plan.
Protects finance company against loss due to any repudiation of repurchase liability on the part of manufacturers' dealers, by agreeing to repurchase repossessed merchandise in such cases.

Finance Company

Furnishes contract forms, rate charts, etc.
Supplies competent personnel to administer plan.
Checks and approves all credits.
Negotiates all supporting agreements with manufacturers and retailers.
Purchases such eligible contracts as meet with its credit approval.
Furnishes all funds.
Handles all collections where payment is not made within twenty days of due date.
Furnishes monthly financial statement of income and expenses.
Agrees to a limited profit on the operation.
Agrees to appointment of advisory committee consisting of representatives of finance company, co-operating manufacturers and utilities to advise as to best use and development of the plan.

Mutual benefits to all

Each party receives benefits in return. The purchaser benefits through a lower finance charge, through the wider availability of credit from dealers, through the better purchase terms made possible, and through the convenience of making payments at the same time and place that the regular utility service bill is paid.

The retailer benefits in that the plan is available to him although he may have small net worth. This is possible, not only because primary dependence is put upon the purchasers' credit, but because the manufacturers back up the retailers' responsibility by a repurchase agreement. Under such circumstances the finance company's requirements of a dealer can be more liberal than under standard plans. The retailer, of course, benefits from the widened market opportunity.

The manufacturer benefits from the increased market for his product, and the availability of a practical finance plan to dealers whose financial position would not justify the extension of a credit service to them under other circumstances.

The finance company benefits by being able to extend a superior service at low cost, while still protected in a reasonable profit. The plan should secure for them a substantial volume of business which would not have otherwise existed. Offering this plan for dealers places them in an excellent strategic position to secure business originated by the co-operating utility merchandise sales department.

Finally, the utility benefits from the increased appliance business, from the good will of customers who prefer to pay for appliances with their light bill and from the appreciation of dealers who now have a favorable finance plan with which to handle time sales.

How the plan works

Announcement of the plan was first made at a mass meeting to which all dealers were invited. Representatives of the utility and the finance company explained the plan and indicated how the dealers could apply for and how they could use the plan. The utility issued a bulletin for all of its public contact employees and one for jobbers' salesmen. At that time there was some concern for fear that customers, put under pressure to pay, would take out their resentment on the utility, and great pains were taken to emphasize the limitations on utility company participation and responsibility. These fears proved to be groundless in subsequent experience with the plan.

The company display department prepared a show card for use in stores calling attention to the new plan and a bill stuffer was inclosed with all bills. Company sales promotion supervisors were thoroughly schooled in the details of operation of the plan and assisted in carrying the story to dealers. The operation of the plan in Buffalo during 1934 produced the following results:

No. of co-operating manufacturers as of 12/31/34	26
No. of co-operating dealers as of 12/31/34	110
Deals purchased	1,680
Dollar volume purchased	$249,063.37
Average amount of accounts purchased	$148.30
Deals rejected for credit reasons	276
Dollar volume rejected	$31,597.74
Installments billed	8,296
Second notices required	1,465
No. installments paid gross	1,336
No. reinstatement fees paid	325
No. accounts repurchased by dealers	59
Dollar volume repurchased by dealers	$6,723.62
No. accounts repurchased by manufacturers	2
Dollar volume repurchased by manufacturers	$125.47
Accounts receivable outstanding as of 12/31/34	$180,825.81
Distribution of business by appliances—refrigerators, 1,128; washer, 297; radio, 186; ranges, 88; ironer, 19; cleaners, 11; oil burners, 2; miscellaneous, 6.	

This record represents a period in which the plan was being built up from zero to its present scope. A conservative estimate of the volume of business expected during 1935 in Buffalo alone is half a million dollars.

From this experimental operation we have come to these conclusions:

1. The plan is practical and meets every essential requirement of a satisfactory dealer finance plan.
2. It has made financing service available to a large number of dealers who could not otherwise obtain financing service.
3. These dealers have accounted for a substantial volume of business that would otherwise not have existed.
4. Delinquencies and repossessions have been normal.
5. Calls upon manufacturers have been so small as to demonstrate that they can assume the obligation of backing up their dealers without undue risk.
6. The utility has found it possible to carry out its part of the plan without criticism and in fact with appreciation from customers grateful for the conveniences offered.
7. All this has been accomplished without requiring the utility (a) to employ any of its funds, (b) to make any merchandise credit determination, (c) to collect any overdue account, (d) to undertake any responsibility for dealer accounts.

Actual operation

As the plan is operated in actual practice in Buffalo, the utility first signs an agreement with the finance company undertaking to do for it the things outlined above, consisting principally of the preparation and mailing out of bills. For these services it receives compensation at the rate of 10 cents per bill sent out, which just about covers out-of-pocket expense. The finance company then secures agreements from the manufacturers whose appliances are in that manner made eligible for the plan.

The plan works very simply in practice. Any dealer having made application and having been accepted may use the plan in selling any appliance eligible by virtue of the fact that the manufacturer has signed a co-operative agreement with the finance company. In negotiating his sale he quotes terms in accordance with the Economy Purchase Plan chart. He obtains the necessary credit information and submits it to the finance company by telephone or by mail. Upon approval of credit he completes the transaction by making delivery of the appliance and submits the signed contract. Commercial Credit Company, after checking, turns the contract over to the utility company for billing.

As long as payments are made promptly this procedure continues until the account is liquidated. If, however, any installment is more than twenty days late the account is returned to Commercial Credit Company and the utility washes its hands of it. Finance company then investigates the case thoroughly and either reinstates the account (fee charged $1) or recommends repossession. Finance company then asks the dealer to repurchase the account, and if the latter fails to meet his obligation calls upon the appliance manufacturer to repurchase the repossessed merchandise.

Unique features

I want to emphasize the special features of the plan, which are different from any finance plan which had been called to our attention:

First, the plan is based on purchaser credit rather than on dealer credit, which tremendously expands sales possibilities. This, of course, is no different than in the case of paper which a utility originates in its own merchandising operations, but is radically different from dealer plans offered by the national finance companies. It is only possible to do this by virtue of the co-operative phases of the Economy Purchase Plan.

Second, this plan discriminates between the prompt and slow payers, giving those who pay within ten days of the due date the benefit of the low finance rate. If payment is made after ten days, but not later than twenty days after due date, the amount of the installment is increased by 25 cents. If the payment is deferred beyond twenty days the account is turned back to the finance company and can only be reinstated by payment of an additional fee of $1. This sounds like a rather curt collection policy, but it brings in the money and gives the benefit to those who deserve it—the prompt payers. It should be kept in mind that when the purchaser is given the privilege of using the Economy Purchase Plan it is pointed out to him very definitely and clearly that such plan is made available because he is considered a good credit risk and prompt pay. It is further made plain to the purchaser at the same time that any default on his part will penalize him as outlined herein, and with such full information there can be no question of "hard feeling" due to misunderstandings.

The third distinct difference is in the billing. Due dates on appliance installments coincide with the due date of the service bill and payments can be made at the same time and place the service bill is paid. This saves writing a check or an extra trip downtown and is a greatly appreciated privilege. It contributes materially to improved collections.

Fourth, and probably most important, the rate charged for the time payment privilege is substantially lower than most rates heretofore available to dealers.

The accompanying table shows a comparison of the net finance charge with some of the better known national plans for several typical contracts.

It will be noted that the Economy Purchase Plan charge is about midway between that of the Electric Home and Farm Authority and the standard commercial plans.

Finally, the Economy Purchase Plan permits installments as low as $3 with correspondingly longer maturities, whereas most of the National Finance Company-Manufacturer plans have stopped at $5 or $7 installments and 24-month maturities. This advantage is particularly important under present-day selling conditions.

So successful has the Buffalo experiment proved that the plan is now being extended to all other territories of Niagara Hudson companies. A year from now a report upon further developments should prove interesting.

Meanwhile, acknowledgment is made to the officers of the Commercial Credit Company, who throughout the experimental period have shown a most constructive attitude, and to the manufacturers who have had the courage to demonstrate a new idea for the benefit of the industry.

Comparison of Net Finance Charge

Unpaid Balance	Number of Monthly Installments	Total Finance Charges (Net) Electric Home and Farm Authority Plan	Economy Purchase Plan	Typical National Finance Company Manufacturer Plan
$ 50.00	6	$ 3.22	$ 5.26	$ 7.00
100.00	12	7.04	9.92	13.04
100.00	18	10.52	14.12	19.16
150.00	18	14.16	17.76	19.02
150.00	24	18.00	22.80	29.76
200.00	24	22.96	27.28	31.60
200.00	36	34.00	39.76	50.92

Rayburn Bill Substitute

Willkie Shows How Legislation Now on the Books Can Be Stiffened to Assure Adequate Regulation of Holding Companies Without Their Extinction

SO FAR lacking a congressional sponsor, but deserving one, none the less, is the regulatory alternative to the Wheeler-Rayburn public utility holding-company bill offered by Wendell L. Willkie, president of Commonwealth & Southern Corporation. In transmitting these proposals to the House committee before which the hearings are being held, he says they are made only on his own behalf and that of his company. But they are so adequately and concisely framed to thwart by regulation what the Administration seems to think only extinction can ban that they will form the basis for the drastic modification which the Wheeler-Rayburn bills need to conserve the true public interest.

These measures have been submitted early enough in the proceedings to afford the focus for constructive comment from utility executives, while they also continue their disclosure of the catastrophic consequences of any such forced dissolution of holding companies as is mandated by the bill now before Congress. The thirteen Willkie points provide for the bolstering of present state regulation, for interstate regional boards to give them enhanced local effectiveness and federal regulation over such matters as do not come readily within the scope of local regulation.

All these proposed measures are addressed as amendments to existing legislation—the securities act, the securities exchange act, the revenue and the federal water-power act. With these laws sufficiently amended the regulatory features of the Wheeler-Rayburn bill would be a superfluity. No new or bureaucratically expanded department would be necessary and there would be no such gigantic stride toward government confiscation of private utility property nor nation-wide usurpation of the states' rights.

In submitting the proposals Mr. Willkie says they would "effectively and completely prevent the occurrence in the future of any of the claimed abuses recited in the proposed bill as the occasion for federal legislation. Here is his code of principles:

1. Require that, after such time as is required for necessary corporate adjustments, all shares of stock shall have one vote.
2. Prohibit the issue of securities, for which the state commission approval is not required, which the Securities and Exchange Commission finds to be detrimental to the investing or consuming public.
3. Extend the securities exchange act to all holding companies by requiring special registration where needed.
4. Require that a majority of the directors of holding and of operating companies and the principal officers of operating companies shall be actual residents of the territory served and that meetings of operating companies shall be held in their service territories.
5. Prohibit the officials of holding companies or of an operating subsidiary from owning more than 1 per cent of the voting stock of any company furnishing services or materials to such operating subsidiary.
6. Require services to a substantially wholly owned operating subsidiary to be rendered at cost, and to an operating subsidiary not so owned, at a reasonable profit.
7. Prohibit upstream loans, except with the approval of the commission or of a state commission.
8. Prohibit the use of operating company employees in the sale of holding companies' securities.
9. Authorize the commission, at the request of a state commission, to investigate the accounts and records of holding companies affecting service charges and other intercompany relationships.
10. Authorize the commission to prescribe uniform systems of accounts for holding companies and subsidiaries, in the absence of state regulation.
11. Prohibit acquisitions of voting stocks of utility companies by holding companies without the approval of the commission or of a state commission, and prohibit acquisitions by others of more than 5 per cent of such stocks without similar approval.
12. Exempt from tax corporate reorganizations for the simplification of corporate structures, when approved by the commission, if effected on or before December 31, 1938.
13. Provide for interstate power boards, composed principally of the state commissioners concerned, to pass upon interstate wholesale power rates.

As regards the adequacy of existing regulation from the standpoint of the consuming public, the memorandum points out that for the consumer the purpose of regulation is completely achieved if he secures adequate service at reasonable rates. The only hiatus in the present power of state commissions over rates is in respect of interstate sales between non-affiliated companies. In this connection Mr. Willkie suggests that provision be made for "interstate power boards" of representatives of the state commissions concerned and of the Federal Power Commission to fix such wholesale rates when necessary.

In dealing with relationships with affiliated companies, Mr. Willkie suggests that if the state commissions require more detailed information as to service contracts and charges of companies outside their states, the Securities and Exchange Commission be empowered to obtain it for them. He also suggests a provision that where substantially all operating companies' stock is held by a holding company, service rendered by the holding company shall be rendered at cost, and where there is a substantial minority interest a reasonable profit should be allowed. He suggests a prohibition against "upstream loans," except with commission approval, and a prohibition against the use of employees of operating companies in the sale of holding company securities.

If further regulation is desired concerning security issues, he suggests that it can be accomplished under the Securities Act by prohibiting issues of securities of public utility companies except with state or federal commission approval, but that both should not be required.

"Proper corporate structures and the elimination of unnecessary companies," Mr. Willkie states, "are desired by the utilities themselves. However, the natural process of simplification is seriously retarded by the tax laws. If these were relaxed, in cases of reorganizations approved by a federal commission, simplification would be expedited. A time limitation for such exemption would provide a real incentive to prompt action."

Simple Interlocking

Developed on the Duquesne System, but Used by Twelve or More Utilities and Industrials — Applicable to Mechanical and Structural Devices as Well as Electrical Equipment

By R. H. LONG
Divisional Superintendent
Duquesne Light Company, Pittsburgh

SEVERAL years ago it was decided to study the important problem of eliminating the personal equation from the operation of dangerous and expensive equipment, in order to reduce fatalities, accidents and costly mistakes. Since a variety of associated equipment of different manufacturers and at different locations must of necessity be operated together as a unit, it was finally concluded that a simple and positive interlock system would best provide the protection desired. Specifications of a satisfactory interlock were prepared and a careful investigation conducted in order to work out a system which would best meet the specifications. Accordingly, a device has been developed and is now known as the "Kirk" interlock.

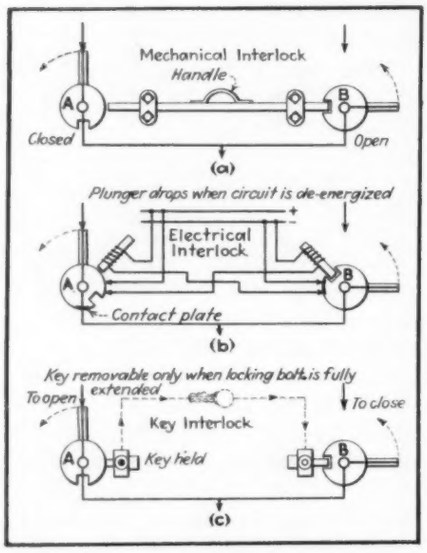


Fig. 1, a, b, c—All commercial interlocks divisible into three general types

Mechanical interlocks, using connecting rods, bell cranks, etc., have the advantage of being quick and positive in action over short distances. However, they are expensive, difficult to install, easy to defeat and are liable to become inoperative due to lost motion when interlocking over long distances. When installed in closed compartments a failure of the system makes repairs extremely difficult.

Electrical interlocks have the advantage of being extremely flexible in operation and can be used over long distances. They have the disadvantage, however, of relying on the functioning of an electric circuit for protection. This disadvantage can be overcome to some extent by using the indirect method, namely, where the equipment is locked when the circuit is de-energized. However, unless fully inclosed they are easy to defeat and in some applications do not prevent manual operation.

Key-operated interlocks, on the other hand, have the distinct advantage of being positive in operation, easy to install and operate, are simple and inexpensive and extremely flexible in their application. They have the distinct advantage of requiring the operator to visit personally each piece of equipment where he can assure himself that the equipment is positively locked before proceeding with the next operation.

The new system consists of simple locking units (Fig. 2) that can be combined and the key of single units can only be removed when the bolt is fully extended, although in some cases additional keys are added that can only be released when the bolt is withdrawn. Three general methods of applying these simple interlocks to all sorts of electrical and mechanical equipment are illustrated (Figs. 3 and 4). A typical problem of interlocking in a switching station (Fig. 5) is solved by the methods shown in Figs. 6 to 9, inclusive, which cover non-trip-free and trip-free oil breakers, gang-operated disconnects and compartment doors.

Master Lock Application—Another innovation of this interlock scheme is the use of so-called master locks. For example, they may be applied at oil circuit breakers to permit special operation for phasing purposes (Fig. 5). For phasing, the oil circuit breaker is first locked open and its

Type of Interlock Used by the New System—It is quite apparent that of the three types of interlock systems shown in Fig. 1 the key-operated type lends itself more readily to the specifications. For this reason an extensive investigation was conducted on various types of locks, lock assemblies and methods of application. The new interlock system which resulted is a simple method of applying, in several combinations, a series of inexpensive, especially designed locking units to all types of electrical, mechanical or structural equipment so as to require operation in any predetermined sequence.

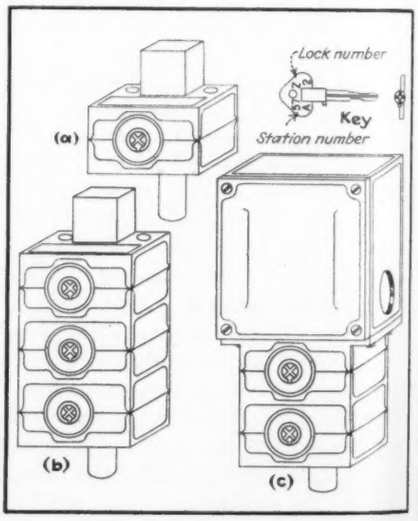


Fig. 2, a, b, c—Simple combinable interlocking units characterizes new system

Operate on the principle that the control key can only be removed when the locking bolt is fully extended to lock the controlled equipment against motion by any means. Actually there are only two types: A single unit (a), where the locking bolt is controlled by one lock; multi-unit (b and c), where the operation is controlled by two or more locks.

The two interlock types can be modified by the addition of special top sections, depending on the action desired. C shows a multi-unit interlock with a panel added for a double-pole, double-throw switch for indicating purposes. In no case is an electric circuit used for protection, the interlocking always being accomplished by mechanical means through the use of the extended locking belt. A solenoid head can be added to control the motion of the locking bolt. An indicating head, containing miniature lamps, can be used to indicate the position of the locking bolt.

Widely Applicable

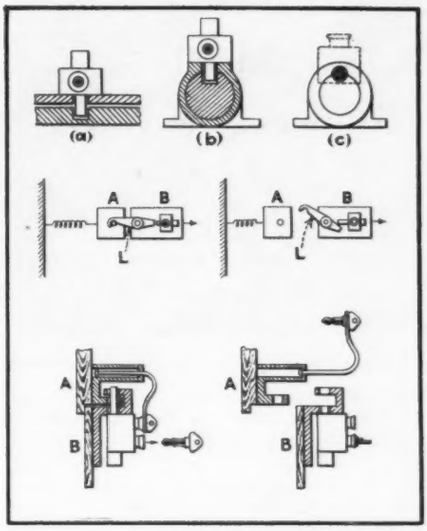


Fig. 3, a, b, c—Three application principles

(a) *Interlocking Sliding Members* — Accomplished by mounting the interlock on either stationary or movable member so that key can only be removed when locking bolt is extended into a recess in the other member, thus mechanically locking device against motion.

(b) *Interlocking Latching Members*—Accomplished by locating interlock so that latch, when in engaged or operative position, acts as blocking member to prevent extension of locking bolt. To remove key, the latch must first be moved to disengaged or non-operative position, where it is held by extended locking bolt while key is removed.

(c) *Interlocking Detachable Members*—Multi-unit interlock is secured to one member and a keeper plate with auxiliary key to other. The two members must be brought together before the control key can be removed. Applicable to all sorts of complimentary members, such as doors, lift-off guards, manhole covers, etc.

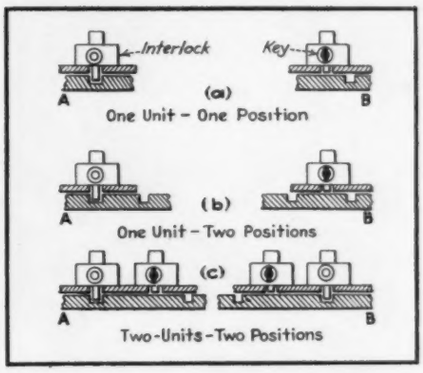


Fig. 4, a, b, c—Three mounting positions

Possession of key in case (a) indicates equipment locked in a definite predetermined position. In case (b) possession of key indicates equipment locked in one of two positions, but does not indicate which. Possession of a key in case (c) indicates in which position equipment is locked. This method is usually employed.

key taken to unlock the bus-disconnecting switch, which is thrown to the open position. Removal of the second key therefore locks this switch against reclosure. Normally this second key is taken to unlock the line-disconnecting switch, but in this case it is returned to the oil circuit breaker to make it operative (Fig. 5). Thus potential can be placed across the terminals of the locked open bus-disconnecting switch for phasing purposes. While this is being done the normal sequence of opening the line-disconnecting switch and compartment doors cannot be completed as the controlling key is now locked in position at the oil circuit breaker.

Duplicate Keys—Any interlock can be quickly and easily removed by breaking the seal at the mounting bolts. However, in order further to simplify the defeat-

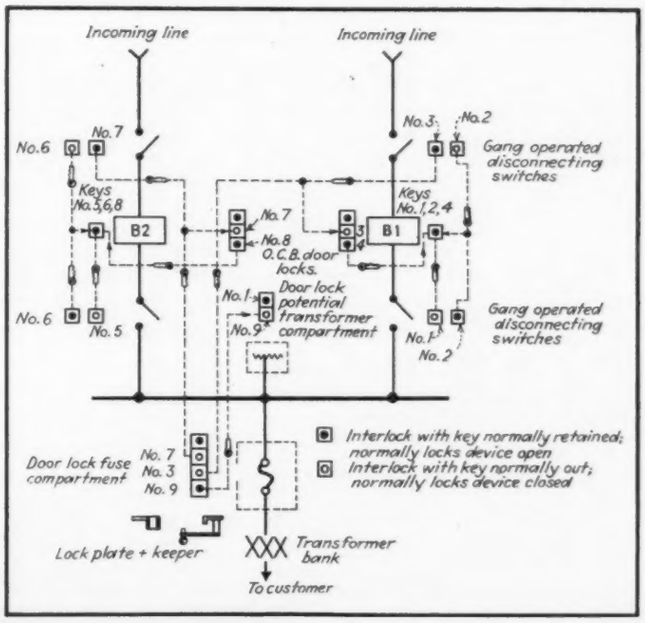


Fig. 5—A typical interlocking problem in a switching station

Oil circuit breaker compartments can be opened by placing keys 3 and 7 in their respective breaker door locks, but only after disconnects and breaker are mechanically locked open. Breakers can then be closed for maintenance by inserting key 4 in the B-1 breaker interlock or key 8 in the B-2 breaker interlock. Fuse compartment can be opened only after both breakers and all disconnects are mechanically locked open, since both keys 3 and 7 are required to open fuse compartment doors. Potential transformer compartment can be opened by key 9 only after the fuse compartment has been opened by keys 3 and 7. Only one set of duplicate keys to open fuse and potential transformer compartments is needed and kept at a place to be designated. For phase checks, gang disconnects on bus side can be opened and breakers reclosed by using key 2 in the B-1 interlock or key 6 in the B-2 interlock, but no compartment doors can be opened.

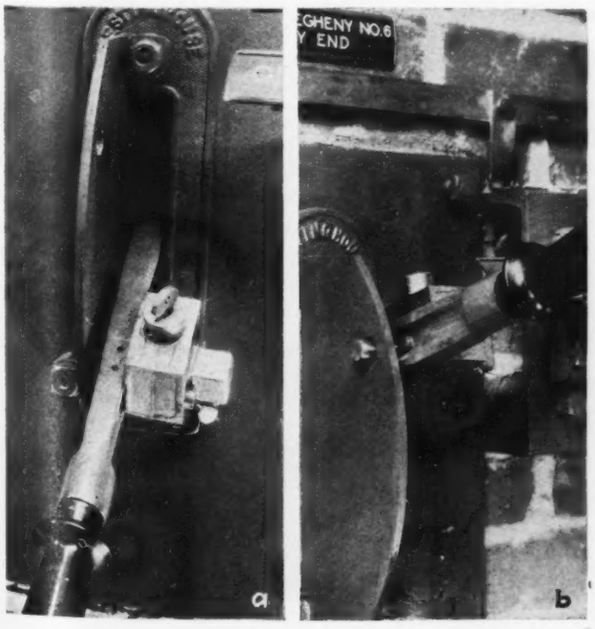


Fig. 6 a, b—Non-trip-free breaker locked against reclosure while key is removed

Blinder plate bolted to face plate with bolt heads peened over to prevent removal. Unit-type interlock secured to handle so that extension of locking bolt is prevented by blocking plate in lower or closed position. To remove control key from interlock breaker must be moved to top position, where removal of key drives bolt through hole in blinder plate.

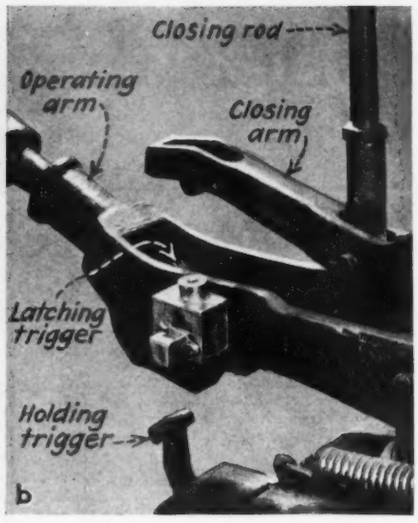


Fig. 7, a, b—Old-style trip-free breaker locked against reclosure while key is removed

Bottom portion of latching trigger, not holding trigger (see Fig. 7a), acts as blocking plate to prevent extension of locking bolt in normal or engaged position. To remove key breaker must first be opened, latching trigger moved and held back with one hand and key operated with the other. This extends locking bolt under bottom portion of latching trigger, holding it in disengaged position.

Breaker is thus inoperative, both electrically and mechanically, as any attempt to close mechanism results in pumping action without closure, as shown in Fig. 7b. Note lower or operating arm will not engage with top or closing arm so no motion can be imparted to contacts. Since this is one of the tests given closing mechanism by breaker manufacturers, no harm can result. Application to the more modern breakers is even simpler.

ing of the system under emergency conditions, extra keys known as duplicate keys are sealed in place in a special key box located near the equipment. Breaking individual seals to permit their use, however, requires a proper entry in the operating log.

Visual Indication—Another attractive feature about this new system is the visual indication given by the position of the interlock bolt. Therefore there is no danger of attempted operation of locked equipment.

Supervisory and Safety Keys—Supervisory and safety keys can be introduced if desired. Thus, a double-unit interlock, instead of a single unit, could be applied at the oil circuit breaker shown in Figs. 6 and 7, so that the breaker could not be locked in the open position until the supervisory key was first secured from the necessary authority. After the operation has been fully completed, as related under Figs. 6 to 9, the safety key could be removed from the compartment door unit and returned to the operating supervisor as an indication that the proper sequence had been carried out. Obviously the equipment could not be returned to normal position until the safety key was returned by the supervisor. This introduces a new method of supervision which has many applications in the operating and manufacturing field.

Fig. 8—Standard gang-operated disconnect locked against reclosure

Interlocks quickly installed by use of electric drill press and screw driver. In the upper, or closed position, hole was drilled through angle-iron support and into rotating shaft. Over this hole right interlock was mounted. With handle moved to lower, or open position, another hole was drilled in shaft for left interlock.

When locked closed, key operating right interlock normally held at oil circuit breaker. Left-hand key cannot be removed in this position because there is no hole in operating shaft under bolt. After breaker has first been opened and mechanically locked against motion, its key can unlock right unit-interlock, permitting disconnecting switch to be opened. Left key can then be removed, locking it in open position, in which position, however, right interlock key is not removable.

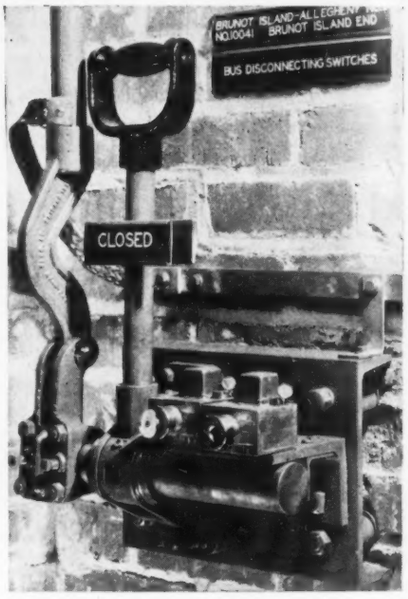
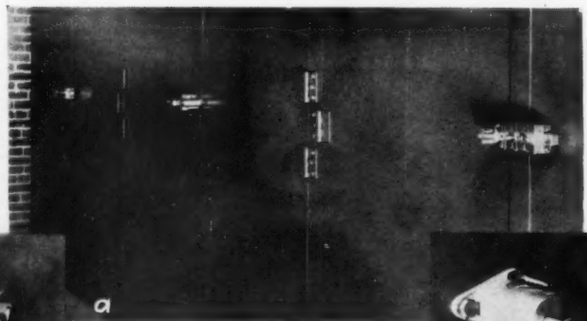
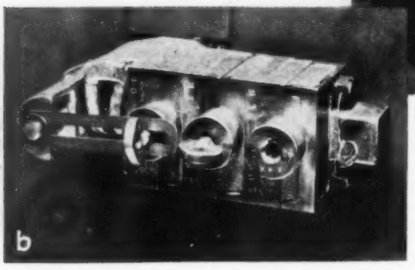
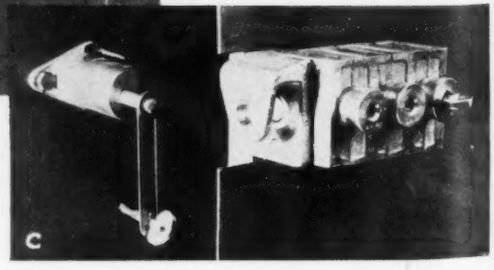


Fig. 9, a, b, c—Compartment doors simply interlocked







(a) Note simplicity of mounting. Interlock unit is secured to one door and keeper casting with auxiliary key fastened to other.

(b)—*Doors Locked* — Operation of auxiliary key, at left, withdraws heavy locking bolt from keeper casting. Middle key (special requirement in this case) when removed permits unlocking breaker mechanism, or can be held as safety key. Neither of these keys can be removed from interlock until disconnecting switches have been locked in open position, releasing key which fits right-hand lock, shown empty.

(c) *Doors Unlocked* — Inserting switch key in right-hand lock permits unlocking of doors. Maintenance men may work freely in compartment, opening and closing breaker contacts with full assurance that it will be mechanically impossible to energize equipment as long as compartment doors are open. There is no way of removing disconnecting-switch key until compartment doors are closed and breaker and auxiliary keys are replaced in their respective locks. Removal of disconnecting-switch key locks doors closed.

Power Shortage Impends

Power Commission Survey Finds $300,000,000 Should Be Spent Soon to Start 50 Plants to Supply Potential Deficiency of 4,000,000 Kw.

EXISTENCE of surplus generating capacity is called a myth anew in the first interim report of the National Power Survey, in progress under the Federal Power Commission since August, 1933. Excess is admitted if the short-range view is taken—and that narrow view seems to the surveyors to have dominated the thinking in the industry for the last five years of stagnation. But looking ahead, the report sees clearly that loads will outstrip capacities before plants can be built unless that building starts promptly. It cautions that only fifteen states and parts of states have substantially more capacity than they are using. Further, it states that "resumption of normal industrial activity" will create "critical shortages . . . in almost every section of the United States." The call is for 50 plants, amounting to some 4,000,000 kw. and $300,000,000 to finance them.

Reminds of two-year planning to meet coming equality

Domestic load has defied the depression, industrial load is marking time for a positive spurt, hardly a new generating station has been erected in five years, obsolescence is taking its toll of the old (half is ten years old, and that is viewed as a hoary age for a steam plant), potential shortage is worst where there should be anticipatory margins and an unwanted war would show us to be worse off than we were in the big war. These are the bases cited for the pronouncement of a crisis.

One of the categorical items in the report virtually admits government projects now in motion can do little to correct this feared serious crisis in power because none are located where industrial resumption would accentuate a shortage.

In the letter of transmittal the commission cautions that it takes two years to plan and construct a modern steam plant and from two to seven years to get a large hydro plant producing. Thus, a 1937 equality of visible load and capacity calls for 1935 planning and financing. Here are the enumerated items in this initial report of the Power Survey:

1. The use of electricity for domestic purposes as well as in certain branches of industry has grown at such a rate during the depression that, upon a resumption of normal industrial activity, the demand for power will be at least 4,000,000 kw. in excess of that which existed in 1929. This is equivalent to the capacity of some fifty large generating stations.

2. Very little new generating capacity has been constructed by the privately owned utilities since 1930. As a result the capacity of existing plants is 2,325,000 kw. less than the demand that will exist for power upon a resumption of pre-depression industrial activity, assuming maintenance of normal reserve capacity.

3. This shortage is being rapidly accentuated by the obsolescence of plants which would have been replaced under normal conditions. As of January 1, 1935, 56 per cent of the total installed steam-electric capacity of the United States was at least ten years old, 11 per cent was twenty years old or older, and about 1 per cent at least thirty years old. Inefficient and obsolete plants with a capacity of at least 2,000,000 kw. should be scrapped and replaced within the near future.

4. Analysis by districts of the relation between the capacity of existing plants and the demand that will be created with the resumption of normal industrial activity shows that critical shortages will exist in almost every section of the United States. The only regions in which substantial surpluses of capacity now exist to meet normal demand are Florida, parts of Michigan and Illinois, an area along the lower Mississippi, parts of Texas, and North Dakota, Idaho, Utah, New Mexico, Montana, Washington, Minnesota and Oregon.

5. Governmental plants provided for or under construction will meet these shortages in certain limited areas. Only one major private power development and one major municipal plant are now under construction. Many of the regions where the greatest power markets now exist and where the shortage will be most acute when industrial activity is renewed do not have projects under construction at the present time sufficient to carry the loads that will develop upon resumption of normal industrial activity.

6. In view of the time required to plan and construct large generating plants, whether hydro or steam, early construction of new plants with an aggregate capacity of between 3,000,000 and 4,000,000 kw. is imperative. This would involve capital expenditures of at least $300,000,000.

7. The critical shortage of existing generating capacity most seriously affects the great industrial districts of the East and Middle West. It would, therefore, be disastrous in case the United States should become involved in war. The situation might be even more acute than that which existed during the World War, when, in many districts, electric service had to be denied to domestic and commercial customers and non-essential industries to meet war needs for power.

8. Careful planning, under federal supervision, of new power plants and facilities for transmission is required to promote the safety and welfare of the nation. Selection of sites for hydro or steam plants, to be developed either by public or private agencies, should take into consideration not only the pertinent engineering and economic factors but also essential considerations of broad national policy.

Power executives dispute commission's conclusions

But these optimistic predictions of the Power Commission were promptly refuted by several industry spokesmen. B. F. Weadock, on behalf of Edison Electric Institute, says there is a current national excess of 20 per cent, and this will be worse when the federal projects start generating. In the New England and Middle Atlantic states the figure is nearer 40 per cent. N. E. Funk of Philadelphia Electric states the excess is now 38 per cent in that territory and it will jump to 59 per cent when the new 165,000-kw. unit goes into operation at Richmond station in July. He surmises that the F.P.C. erased all the older generating capacity in computing the availability of stations to meet prospective loads. Siding with him in this, J. T. Barron of Public Service Electric & Gas Company asserts that much of this improperly called obsolete equipment will justifiably and economically remain active as peak or base capacity for many years to come.

Widespread Response to

Comments From U. S. Representatives, Senators, Commissioners, Governors, Publishers, Executives of Investment Institutions and Business, Consulting Engineers—Others Promise Comments After Thorough Reading

CONCEIVED in a spirit of service to the general public, business as a whole, and especially the electrical industry, which has suffered immeasurably under political attack, ELECTRICAL WORLD'S Recovery Number of March 30 was addressed to and distributed among an audience beyond its normal circulation.

The theme of the issue was a program for recovery through unshackling private initiative. Recovery was considered in its broadest sense—increased employment, payrolls and a higher standard of living; more business for not only the electrical industry but for producers of raw and manufactured products; safety to investors. The $16,500,000,000 recovery program was based on available markets which can be developed by teamwork in the electrical industry, provided it is relieved of the attacks and legislation which now stifle its efforts. It has the collective resources, ability, experience and organization to do the job better than any one else. The markets were outlined in detail—home, farm, commerce and industry. A conservative program for developing the market was advanced.

Recognizing that distribution of the program among our normal readers in the electrical industry could not produce results because of present and pending restrictions on business, particularly the utility business, this issue was sent to representatives of the public. It was delivered by special messengers to each member of the United States Cabinet, and both houses of Congress. It was also sent to every governor and regulatory commissioner—Federal Power, Interstate Commerce Commission and State Utility Commission. Executives of insurance companies, investment houses and numerous business organizations received it.

A great number of replies have already been received. Excerpts from some are presented here. It is evident from the comments received that there is widespread agreement with the program. There is sentiment voiced by official Washington against further attack and crippling of utilities.

What U. S. Representatives Say—

Representative Chester Thompson (Ill.)

I wish to acknowledge your letter of March 30 relative to public utility holding companies, and can assure you that I will give any legislation dealing with the same the most conscientious consideration, inasmuch as I appreciate the importance thereof to the investors of the nation. I know that I will enjoy reading your National Recovery Number of the ELECTRICAL WORLD.

Representative Joe Starnes (Ala.)

I have an open mind on the power situation, although I have some very definite ideas. I think that some of our fine utility companies are unnecessarily exercised over the present situation. Speaking as a member of Congress, I certainly will not vote for legislation which will destroy any legitimate business where there is an actual investment. Congress has no desire to hinder, cripple or destroy industry and business. I regret the unfair propaganda which is abroad in many places that Congress is seeking to curtail business and industry. On the contrary, we sincerely desire to do everything we can to restore this country to a normal basis. If we had more co-operation and less of criticism the pulse of recovery would be accelerated.

Representative Dewey Short (Missouri)

I have your letter of March 30 and I presume the National Recovery Number of your magazine will arrive tomorrow. I shall be glad to read it, for I am sure that I will find it informative, and that our views are in accord. The enclosed copy of the form letter which I am using as a reply to the flood of letters I have received outlines definitely my opinion on the Rayburn bill. Despite the pressure the Administration is bringing to bear, I do *not* believe this measure will pass in its present form.

It is a pleasure to assure you that your views coincide with mine. I think that this measure would retard recovery and would work an undeserved hardship upon the many people of modest financial position who comprise the greatest class of holders of public utilities stock.

No doubt you observed from the press that on March 12 President Roosevelt, overriding precedent against expression of executive opinion concerning legislation pending in committee, sent a special message to Congress demanding that the Rayburn bill be passed without change, denouncing letters such as yours as "propaganda" being spread throughout the country to defeat the bill, and urging that members of Congress disregard them. The President's message was a perfect example of propaganda *favoring* the bill, and the Democratic majority in the House immediately ordered 50,000 copies printed at government expense for distribution calculated to bring pressure for the enactment of this vicious measure.

Undoubtedly there have been abuses in the field of holding companies which should be corrected, but not by way of arbitrarily demolishing the entire structure. Why kill the patient in order to cure a rash?

Representative Clarence F. Lea (Calif.)

Manifestly in attempting to eliminate the evil practices in connection with the operations of holding companies, we must recognize that just consideration is due both the investors and the consumers. As a member of the committee before which the holding company bill is pending, I shall endeavor to consider and act upon the measure with just regard to the rights of investors.

It is my desire to support necessary

"National Recovery Number"

and proper legislation to prevent, as far as possible, the recurrence of the marked abuses that have characterized many holding company operations. I desire to accomplish that purpose with due regard to the rights of investors and consumers and with the least practicable interference or injury to investors, consistent with that purpose.

Representative J. George Stewart (Del.)

Please be advised that I am opposed to any legislation of this type that has for its ultimate purpose literal "confiscation." Unless legislation is introduced, whereby the savings and holdings in this group of securities are protected, I shall oppose it.

Representative Hamilton Fish (N. Y.)

You may be assured of my opposition to any proposal which would further handicap industry and continue the present Administration policy of destroying business confidence and retarding recovery, and shall be very glad to give this matter careful consideration when presented on the floor of the House, having your views in mind.

Representative Emmet O'Neal (Ky.)

The March 30 edition of ELECTRICAL WORLD came to my office and I read it with much pleasure and profit. I was very glad to have the information relative to holding companies, and I feel that the facts should be given to every member of Congress.

Representative R. M. Russell (Mass.)

There are some good holding companies that serve a very useful purpose in relating operating companies that should be related for geographical and economic reasons. They should not be destroyed. There are, however, others where no such relationship has existed, but where the device has been used to build up an indefensible capital structure, and by this process fleece innocent investors at prices totally unrelated to any real asset or present earning value, and based to a large extent on unwarranted hopes or expectations. Such abuses in corporate financing should be prevented.

I have expressed to Mr. Rayburn, chairman of the committee to which the bill has been referred, the general views which you and other constituents have set forth in the many letters which I have received on this subject. I believe the bill will undergo many changes before it is reported for action. I hope and trust, as finally enacted, it will prove to be a very beneficial piece of legislation of which you will approve, and I shall do what I can to accomplish such purpose.

Representative J. W. McCormack (Mass.)

I want to express my appreciation of your conveying your views to me on the legislation referred to therein [ELECTRICAL WORLD Recovery Issue]. In reply will say I am following this legislation very closely and I will oppose any features of this bill, or any other bill, which I consider to be too drastic, or which I consider unnecessary.

Representative Arthur W. Mitchell (Ill.)

Acknowledging receipt of your letter of March 30, I write to say that all legislation pertaining to the NRA is being considered by the Senate finance committee at the present time, and that utility legislation is being considered by the House interstate and foreign commerce committee. When this legislation comes before the House of Representatives for consideration, I shall be glad to study it carefully and vote for what I regard as the best interest of all concerned. In this connection, I shall consider all the facts set out in your National Recovery Number.

Representative Theodore L. Moritz (Pa.)

With reference to the present legislation noted in your letter I wish to state that at the present time I am making a careful study of these measures. I have them under consideration with the definite view in mind that my future procedure will be for the best interest of the public.

Representative Thomas R. Amlie (Wis.)

I am taking this means of replying to the many letters I have received requesting information about the Rayburn bill to regulate public utility companies. This measure is now in committee, and will probably not be reported out so that it can be voted on in this session of Congress. I am enclosing* a copy of a speech which I made in 1932, in which the results of a partial survey of the field of public utilities by the Federal Trade Commission are referred to. The Rayburn bill would not, as has been alleged, destroy the values of investments in public utility securities, but would, on the contrary, protect the values from the danger of destruction by unscrupulous management.

*Congressional Record, April, 6, 1932.

U.S. Senators Reply—

Senator Arthur Capper (Kansas)

I thank you for sending me a copy of your National Recovery Number and I wish to compliment you on having produced something very much to the credit of your staff. It contains information that is most *convincing* and will be very *helpful to Congress* and others interested in public utility affairs. There is no doubt many of the utilities have done good work and are entitled to fair consideration so far as the legislative program is concerned.

Senator Alva B. Adams (Colorado)

A recurrence of the abuses and frauds that have been perpetrated upon the investing public through misuse of holding companies should be prevented if possible. I hope, however, that this may be accomplished without doing injustice to the people who have in good faith made investments in holding company securities. I am glad to have your views and will bear them in mind when this measure is before the Senate.

Senator Hugo L. Black (Alabama)

Your communication was received with reference to legislation regulating holding companies. This legislation will be considered by the Senate committee on interstate commerce. When it reaches the Senate floor I shall be glad to give it careful consideration.

Vice-President Garner's Secretary

Your letter of March 30 to the Vice-President, advising that you are sending a copy of your National Recovery Number to Mr. Garner, is received. I am sure that Mr. Garner will read the number with interest; however, he never expresses his reaction to newspaper or magazine articles. In fact, he does not express his opinion concerning any public question except to the President and members of the Senate and House.

Vice-Chairman Basil Manly (Federal Power Commission)

I appreciate your thoughtfulness in sending me your National Recovery Number, which I shall read with the greatest interest. The interim report of the National Power Survey, which is now on the press, will, I am sure, provide a large amount of material which should be helpful in promoting recovery in the electrical industries.

Commissioner B. H. Meyer (Interstate Commerce Commission)

The March copy of the ELECTRICAL WORLD arrived yesterday. A glance at it is sufficient to indicate the vast amount of labor which must have been expended in its production. Since you were good enough to send a copy of this issue to each member of the commission, our organization will be fully provided.

Chairman Hugh M. Tate (Interstate Commerce Commission)

As the argument before the commission was finished before the noon adjournment [April 3], I had an opportunity to give it [ELECTRICAL WORLD Recovery Issue] considerable attention this afternoon. You have certainly presented your case in an attractive manner and in a way to stimulate public thought on the question.

In view of the fact that the proposed legislation as to holding companies is still pending and the further fact that the Interstate Commerce Commission may be asked to express officially its view on the legislation before committees of the Senate and of the House, I fear it would not be quite within the proprieties for me to express further comment at the present time, in view of my being chairman of the Interstate Commerce Commission.

I assure you I am interested and that I regard this volume as an addition to any library. I am lodging this copy that I have received with the library of the commission.

Governor Alf M. Landon (State of Kansas)

I am greatly interested in your remarks and will be glad to examine the editorial at the first opportunity. I am glad to have the benefit of your views on the relief situation.

Governor Harold G. Hoffman (State of New Jersey)

Please be assured that I shall read this magazine [Recovery Issue] with a great deal of interest and I shall pass my comments on to you when I finish.

Planning to Read

Letters from the following public personages indicate that they will comment frankly after examining the issue carefully, or will be guided by the facts presented.

Cabinet Members

Secretary of State, Cordell Hull; Secretary of Treasury, Henry Morgenthau, Jr.; Secretary of War, George H. Dern; Secretary of Interior, Harold L. Ickes

U. S. Senators

Connecticut—Frances T. Maloney
Idaho—James P. Pope
Louisiana—Huey P. Long
Maine—Frederick Hale
Massachusetts—David I. Walsh
Michigan—James Couzens
North Carolina—Josiah W. Bailey; Robert R. Reynolds
Ohio—Robert J. Bulkley
Oklahoma—Elmer Thomas
Tennessee—Nathan L. Bachman
Texas—Morris Sheppard
Utah—William H. King; E. D. Thomas
Washington—Homer T. Bone

U. S. Representatives

Speaker of House—Joseph W. Byrns
Alabama—Samuel Hobbs; Henry Steagall
California—Clarence F. Lea
Connecticut—James A. Shanley
Idaho—D. Worth Clark
Illinois—John T. Buckbee; Leo Kocialkowski
Indiana—Eugene B. Crowe
Iowa—Fred C. Gilchrist; Otha D. Wearin
Kansas—Clifford R. Hope
Massachusetts—Arthur D. Healey; Edith N. Rogers; George H. Tinkham
Missouri—C. Jasper Bell; John J. Cochran
New York—John J. Boylan; James P. B. Duffy; Charles D. Millard; Caroline O'Day
Pennsylvania—Charles N. Crosby; Matthew A. Dunn; Charles R. Eckert; Harry B. Ransley; William H. Wilson; Joseph Gray
Texas—Marvin Jones
Virginia—A. Willis Robertson

State Governors

Alabama—Bibb Graves
Florida—David Sholtz
Idaho—C. Ben Ross
Louisiana—Oscar K. Allen
Nebraska—R. L. Cochran
New Mexico—Clyde Tingley
New York—Herbert A. Lehman
Oregon—Charles H. Martin
Pennsylvania—George H. Earle
Tennessee—Hill McAlister

Utility Commission Chairmen

Maine—Albert J. Stearns
Pennsylvania—C. J. Goodnough
Federal Power Commission—Clyde L. Seavey
Interstate Commerce Commission—Secretary—George B. McGinty; William E. Lee; Charles D. Mahaffie; B. H. Meyer; Carroll Miller

Investment Institutions

Winthrop W. Aldrich, chairman Chase National Bank, New York City
Thomas A. Buckner, president New York Life Insurance Co.
Thomas I. Parkinson, president Equitable Life Assurance Society

James McMillen (Evans, Stillman & Company, New York City, Investment House)

Your "National Recovery Number" is a monumental piece of work. The utility industry has had much discriminatory legislation directed against it. It has been called on to carry special, heavy tax burdens. It has had to meet economic difficulties brought on by the depression. Any industry with less vitality would *not* have been able to withstand this combination and still render efficient service. It is a testimonial to its strength that it has been able to do so, and you have done an excellent service to the country in presenting impressive evidence in this respect.

The fostering of government competition is against all American ideals and principles. That it is against the American Constitution is beginning to be proved in the courts, where facts only count. The antagonistic attitude of the Administration, which has made itself forcibly felt, together with the persistent harassing by politicians generally, in our opinion, is largely responsible for the terrific shrinkage in the market value of utility securities.

In view of the large stake which the American public has in the utilities and the importance of the buying power of the utility industry in a normal and sustained recovery program, it is to be hoped that this magnificent book will have a wide circulation, an intelligent and fair reception in high places, and that it will be influential in furthering the unification and sentiment in favor of private initiative in business as against a further expansion of governmental activity.

A. E. Kennelly (Professor Emeritus of electrical engineering, Harvard University, Cambridge, Mass.

Please accept my compliments upon the National Recovery Number of the ELECTRICAL WORLD of March 30. I think the tone of the articles is very restrained, considering the severe ordeal brought upon the utilities by a huge antagonistic bureauracy.

You can imagine how it distresses me to see the industry that Mr. Edison worked so hard to found, when I was with him at Orange, N. J., become the football of politics in attempted suppression and confiscation.

Secretary C. H. B. Chapin (Empire State Gas and Electric Association)

The articles, and particularly the graphic charts and statistics, are extremely well done and should be very helpful in the emergency with which the electric industry is now confronted.

Utility Operations Increase

Revenue rises to three-year and energy to five-year high, with record-breaking domestic sales.

ONLY once before have the January sales of energy for electric light and power exceeded those reported this year. That was in 1930, and except in the last three months of 1929 leading up to that peak they have never before been equaled. Energy generated rose 8.8 per cent compared with the like month of 1934 to 7,799,000,000 kw.-hr.; sales, after allowing for additions from other sources and for losses in transmission, transformation and distribution, were up 9.4 per cent to 6,468,731,000 kw.-hr., missing the record of five years ago by less than 4 per cent, according to figures announced by the Edison Electric Institute.

As to the revenue of $170,101,000 the comparisons are somewhat less favorable. The gain over January, 1934, was 5.0 per cent and therefore definitely smaller than the increase in energy sales. The revenue itself was the largest for any month since January, 1932, but had been materially exceeded on a number of earlier occasions. Thus recovery in terms of revenue has proceeded less far than in terms of energy consumption. This is doubtless true to an even greater extent with reference to net earnings, for it is known that operating expenses and taxes have been increasing, but definite statistics on this point are not available.

Industries taking more energy

One record was definitely broken by the rise of domestic energy sales to an all-time high of 1,316,743,000 kw.-hr., 5.9 per cent more than in the like month of last year and 7.4 per cent more than in December. In retail commercial energy sales the year's gain was 7.1 per cent.

Wholesale commercial sales are of especial interest as being indicative of industrial activity. They have been showing a widening margin over the preceding year's sales, now grown to 14.1 per cent. They surpassed, in January, the average of the last four months of the preceding year, as well as the average of that entire year. Neither of these things had happened in the past six years, which is as far back as the records go. To approach the previous summer's peak within 6 per cent also was unique.

In releasing its statistics the E.E.I. stated that they are subject to revision. Due to the many reports required of the cooperating companies by various governmental agencies as well as the great amount of work in connection with pending legislation, it was difficult for the companies promptly to make their regular returns to the E.E.I.

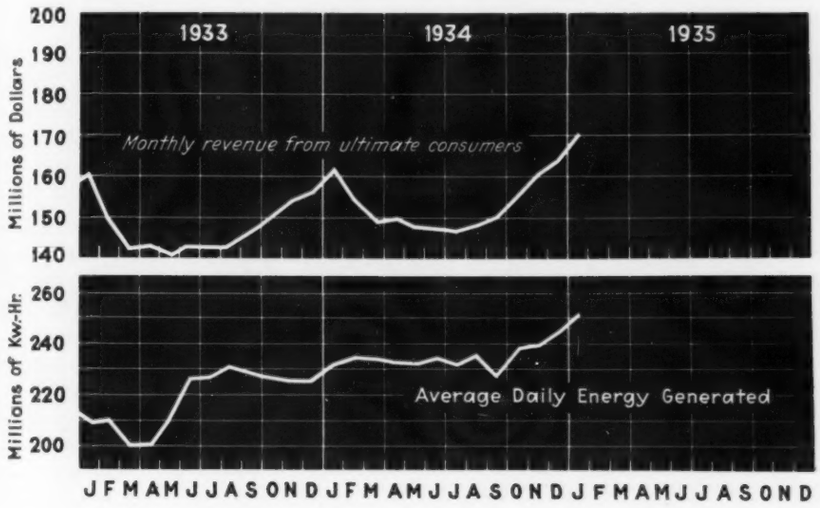


Table I—Monthly Revenue from Ultimate Consumers and Energy Output of Central Stations in the United States

Compared with Corresponding Month of Previous Year

Month 1935	Revenue from Ultimate Consumers		Energy Generated, Millions of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc	Gen.	Per Cent. Inc.
January	170,101†	+5.0	7,799	+8.8	3,128	+11.0	4,671	+7.3
1934								
December	163,807	+2.4	7,601	+8.7	3,039	+18.6	4,562	+8.7
November	160,451	+4.2	7,203	+6.3	2,801	+20.4	4,402	—1.0
October	155,811	+3.6	7,424	+5.5	2,548	+ 4.7	4,876	+6.0

Table II—Regional Revenue and Energy Output in January, 1935

Compared with Corresponding Month of Previous Year

Geographical Region	Revenue from Ult. Consumers†		Energy Generated, Millions of Kw.-Hr *					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.
United States	170,101	+5.0	7,799	+ 8.8	3,128	+11.0	4,671	+ 7.3
New England	15,052	+4.8	566	+ 9.8	280	+14.3	286	+ 5.6
Middle Atlantic	52,099	+5.9	2,010	+ 7.3	653	+ 1.4	1,357	+10.3
East No. Central	39,096	+5.5	1,864	+ 6.4	193	+33.3	1,671	+ 4.0
West No. Central	14,451	+5.2	546	+21.8	159	+82.0	387	+ 7.2
South Atlantic	20,031	+1.6	964	+10.3	635	+33.5	329	—17.3
East So. Central			335	+16.2	276	+16.1	59	+16.8
West So. Central	8,913	+4.4	323	— 1.3	27	+48.8	296	— 4.2
Mountain	4,756	+4.7	240	+ 8.6	156	— 9.8	84	+75.0
Pacific	15,703	+5.4	951	+ 9.0	749	— 5.8	202	+157.0

*By courtesy of U. S. Geological Survey, with deductions for operations not regarded as central station.
†Preliminary.

Table III—Allocation of Energy January, 1935

Compared with Corresponding Month of Previous Year

Class of Service	Millions of Kw.-Hr.	Per Cent Inc.
Total for distribution*	7,763	+ 8.9
Lost in transmission, etc.	1,294	+ 6.0
Sold to ultimate consumers	6,469	+ 9.4
Domestic	1,317	+ 5.9
Com'l, small light and power	1,245	+ 7.1
Com'l, large light and power	3,136	+14.1
Municipal street lighting	222	+ 0.0
Railways—street, interurban	431	+ 8.8
Railroads—electrified steam	67	+ 8.9
Municipal and miscellaneous	51	—33.2

*Generated, purchased from other sources, imported, less energy used in railway and other departments.

One of a Series of Intimate Talks with Industry Executives

Wyman Discusses Taxation

An Interview by

H. S. KNOWLTON

WITH the remorselessness of a rising tide, taxes imposed upon electric utilities threaten to inundate net earnings to the point of disaster unless halted by the all-powerful force of public opinion. One of the industry's executives who has sensed this peril for a long time is Walter S. Wyman, president of the Central Maine Power Company. Because Mr. Wyman has not been content merely to recognize the taxation problem as a difficult one and then let it go by passing its burdens along to his customers without protest, I asked him to set forth his views upon it for the benefit of ELECTRICAL WORLD readers.

"What does taxation mean to Central Maine, Mr. Wyman?" was the first question. "It means a contribution to the public treasury of more than $3,000 for every working day in 1934," said the electrical pioneer of the Pine Tree State. "Putting it another way, it means that 14.8 cents on every dollar of our gross income goes into taxes. Where we used to think our taxes were high when we paid 10 or 11 per cent of gross in this way, we cannot be at all sure that our present burdens will not be increased beyond the 1934 level. Some utilities are already forced to find 20 cents on the dollar to satisfy the taxgatherer's demands. In our case our total taxes in 1934 exceeded $875,000, or over 65 per cent of our entire preferred-stock dividend requirements. In the five years beginning with 1930 we have paid $967,000 more than would have been paid had the 1929 tax been continued through the half-decade. Our total taxes have increased over 70 per cent since the beginning of the depression.

"This situation is a grave one for all utilities," said Mr. Wyman. "We do not claim that companies in New England are worse off than others in this respect, but we do not intend to sit still and merely endure it. Some people say that since utility customers are the only source of revenue for taxes, all we have to do is to pass the burden along. This is not a very good philosophy of management, because our customers, our employees and our stockholders are all affected by our costs of doing business. We are hampered in our efforts to serve all three of these classes in interest when we are subjected to excessive taxation.

"The federal government requires us to pay a tax on our net income and also an unjust 3 per cent tax on the gross income we receive from a large number of our customers. The state, cities and towns tax us on our property. I think that the stockholders of Central Maine Power, and indeed of all other utilities, should take a firm stand against any steps that may be advanced for putting still further taxes on the business of the light and power companies, under whatever guise they may appear."

"Mr. Wyman," came the next query, "did not investors in the power industry put their savings into this field in confidence that under regulation a fair return might be expected?" "Certainly," was the reply. "Years ago, when regulatory commissions were first established by the states, the doctrine was plainly stated as a sort of platform that the public utility business be allowed to earn a reasonable return on the fair value of the property and no more. Based on the assurance of this platform, which was made a part of the law in 75 per cent of the states of the Union, a great many million dollars have been invested. Much of this money has been invested by banks, insurance companies, for old-age pensions and trust funds, teachers, farmers and every-day conservative people."

Questioned as to ways of meeting the menace of taxation, Mr Wyman said: "The problem is far from a simple one because it is involved with widespread activities of government in fields formerly occupied entirely by private enterprises and good citizenship. However, if the investors and employees in the electrical industry and all its collateral manufacturing and service branches join in constantly protesting against waste in government and in demanding that taxes be allowed to go no higher, but be reduced as fast as practicable, a measure of success may be achieved. If the politicians find that the spenders in office are losing favor with the people, as Mr. Ferguson of Hartford has often declared, excessive taxation may be curbed. Meanwhile we are going ahead with energy to build up our business and to see if we cannot increase the consumption of electricity sufficiently to make our rates still more attractive, and so enhance our gross and net earnings. We are constantly studying the problem of rates even in the face of throttling increases in taxation, and are thoroughly aware of the importance of low prices as load builders.

"If our customers come to realize that high taxes are obstacles to their obtaining electrical service at lower cost to themselves per unit consumed, we shall find, I think, increasing pressure upon the public authorities to conduct more economical government. Signs are appearing that the public is becoming more tax-conscious, and if we make vigorous and sustained efforts to make the situation clear, coupled with intensive cultivation of business at reasonable prices, a measure of relief may be expected. It is of primary importance to call a halt on taxation before it is too late. Unfair levies like the 3 per cent federal tax on gross income should be done away with at the earliest possible moment; excessive tax charges should be stopped and reduced in the interest of business recovery all along the line, and no stone should be left unturned to enlist the co-operation of the public in this sound movement for the welfare of us all."

WALTER SCOTT WYMAN, president of Central Maine Power Company, has been warning citizens of the Pine Tree State that rising taxation threatens users of electricity as well as stockholders and employees. He urges constant protest to those in public office against further increases, and while calling for more economical government turns to aggressive business building as the guiding managerial policy for utilities.

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Oozy Film of Propaganda

TO THE strains of the United States Marine Band the tale unfolds of a broad river whose shores and whose thousand tributary streams lie in many states. For a hundred years man has made plans to tame this river, for in flood it is a torrent that cries out for taming.

And now the taming has begun. The Tennessee Valley Authority commands the Tennessee River to the uses and advantages of man, backs its words with acts and the river no more will leave misery and devastation in the wake of its receding floods. Also, the inhabitants of these wooded hills and malarial valleys, whether they will or no, are to become the dwellers in a land that has its like nowhere this side of Paradise Regained. Their happy destiny has been determined for them and they have nothing to say in the matter whatever. Here is to be a sweet land, a dear land, where children romp in the dappled shade, where mother (used to be "maw") reclines in cushioned ease and electric devices do the laundry, cook the dinner, sweep the house and perform all the housewifely tasks, while father ("paw" aforetime) works his five and a half hours building dams.

All these things, promises of a better future, are to be seen in the movie, "A National Program in the Tennessee Valley," produced and exhibited by the Tennessee Valley Authority. But the sweetest, the dearest, the loveliest thing of all in the picture, the thing that is calculated (cunningly) to make each member of the audience a booster for the regimented state, is the baby—chubby and healthy and happy in his crib—that fades so cleverly into the picture of a long dam across a river with the water rushing over it.

Who said propaganda?

The production of this picture cost plenty of money. The distribution of it for exhibition is costing money. And its showing before civic clubs, neighborhood groups and organizations of every kind also costs money. This cost is being borne by the taxpayers of the United States for propaganda aimed at the destruction of a twelve-billion-dollar industry in which millions of American citizens have their money invested. These same investors as taxpayers are assessed to pay for the very propaganda aimed at destruction of their investment.

Who said propaganda?

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Power Salesmen on the Alert

A RETURN of industrial activity should stimulate power sales departments to go after business. One of the best opportunities that will kill two birds is to sell steam as well as electric power to industries which have a need for this combined service.

This type of business provides generating capacity at the load and thereby saves investment in transmission, transformation and distribution. It increases the system generating capacity in small economical steps. It makes unnecessary the building of new industrial power plants. It makes possible the taking over of old industrial power plants.

Undoubtedly the industrial conditions and present costs in power production make it possible and profitable for utilities to negotiate for this business to the benefit of themselves and the industrial plants.

But the resumption of production in industry under new conditions makes it worth while for utility power salesmen to survey the equipment and production processes of all industrial customers. There have been new developments and new equipments, competition is keen and remodeling of existing industries must be had. All this usually means the use of more electricity and more electrical equipment. If utility salesmen know their business they can give aid to industrial customers and at the same time increase their sales. The power sales departments should be up on their toes these days and overcome any depression inertia that may exist.

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Cheaper Than in Europe

AGGRESSIVE selling of electric service is not confined to the United States. Foreign publications show methods very similar to ours. Those of the Berlin (Germany) City Electric Company, for example, match the best American practice for variety, ingenuity and sales appeal.

Under the circumstances, one might expect to find the domestic rates to be low. But that is far from being the case. The small consumer in Berlin is charged for energy at the rate of 8 cents per kilowatt-hour plus a service charge which depends on the amount of the connected load. For example, if a home is equipped with fifteen 50-watt lamps and with six small appliances (aggregating not more than 1,500 watts) the service charge amounts to 97 cents. If the

customer uses 50 kw.-hr. per month his total bill is $5, or 10 cents per kilowatt-hour.

Nor would the inducement rate, which applies only to fully electrified homes, be considered attractive in the United States. The energy rate is 3.2 cents per kilowatt-hour and the service charge varies with the number of rooms, averaging around 80 cents a room, but favoring small apartments. For a six-room home it is $3.85. The customer would have to use as much as 480 kw.-hr. a month to bring the average rate down to 4 cents per kilowatt-hour.

South of Germany is the little confederation of Switzerland, mountainous, abounding in water power on glacial streams, noted for the achievements of her engineers and the skill of her artisans and for the high educational level and the spirit of freedom of her people. Here, if anywhere, electricity should be cheap. But is it?

According to the 1934 edition of the London "Electrician" Annual Tables the domestic rate in Zurich and Berne ranges from 16.2 to 6.5 cents. These are cities of 250,000 and 110,000 population, respectively. In Lucerne and vicinity the range is from 14.5 to 9.7 cents. In addition there appear to be service charges.

Coming down the Rhine to Holland, the lighting rate in Rotterdam, chief city, ranges from 17 cents to 3.4 cents, according to the same source of information. For heating and cooking the rate is 3.4 cents.

Electricity is cheaper here than in Europe, while incomes are larger. Instead of grumbling, we ought to be grateful for the achievement.

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Interchange Cross-Checks

WHEN interchanging power between large systems, low unit prices for energy are common, because buying and selling are based generally upon increment costs of operation. These prices may be expressed in a few mills per kilowatt-hour in many cases, but they may expand into very substantial dollar totals if the volume of energy transferred is considerable. Because of this, close checking of computations is highly desirable as a means of protecting interconnection savings, and where sufficient confidence exists between the engineers of the two or more companies concerned to maintain a supervisory system of cross-checking of each other's figures, operations are likely to prove very satisfactory indeed.

There seems to be ample warrant today for working out prices openly in intercompany dealings. This means willingness to share individual data on turbine slopes, fuel increments, maintenance and supply costs, line losses, energy transfer costs, desirable metering locations, allowances for metering at convenient substations or generating plants instead of town boundaries or property limits, co-operative calibration of instruments, boiler banking costs, anticipated loads at specified times of day and night, power-factor correction and available line and cable capacities. Cross-checking of interchange computations does not mean doubt as to the word of either party as practiced on two important systems in the East. It is primarily a safeguard against errors which were potentially capable of cutting down shared savings if not throwing interconnections into the red from time to time.

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Relentless Depreciation Stimulates Supply Sales

COMPLAINTS of not a few utility engineers that "nothing is being done today in the way of plant improvement" do not match with the facts on a good many properties. Admittedly, spectacular developments outside the field of government activity are lacking for the moment, but the run-of-mine total of replacements due to depreciation, wear and tear, obsolescence and failure of material spells unceasing purchases even in the face of the policy of examining both sides of every cent before spending it. On one system, for example, overhead wire replacements in the past three years have totaled 1,886,000 ft. costing over $46,000. Last year 0.69 per cent of the total overhead wire on the distribution system was replaced, and notable improvements in the composition of weatherproof insulation give promise of continued modernization of such circuits. The fluctuations of load have little to do with these necessities.

On an Eastern system more than 361,000 ft. of underground cable was replaced in a like period at a cost of about $160,000 for material. Failures varied per year from 19 to 27, external mechanical injury being the major cause. The percentages of system total cable replaced varied annually between 0.23 and 0.55. The story on transformers is interesting. To the junk pile went 1,619 units out of about 11,000, and the number of defectives removed ranged from 3 to 4.7 per cent of the total in service. The system total transformer connected capacity is around 300,000 kva. Here is a capital investment of vital importance to high-grade service which must be maintained at a first-class engineering status in any efficient conduct of affairs. Sustained study of lightning conditions is being pushed in this connection; failures in the outlying areas most exposed to hazard are rapidly decreasing, and modern designs of transformers are succeeding old-timers hitherto venerated because they have lasted so many years. The pressure of time and constant service is relentless, and while the total costs involved in much replacement work are moderate compared with the appropriations for development before 1929, careful engineering and management sensible of long-pull values are doing their part to hold up service standards and performance essential to present load volumes and forthcoming expansion of business.

Consolidated Gas Moves for Merger

Stockholders approve resolution providing for merger of all units — Rate cut demanded by Dunnigan — La Guardia's measure beaten in Albany

Resolution paving the way for the merger of all units in the Consolidated Gas Company of New York system was approved this week by stockholders at an adjourned meeting. The resolution authorized "an extension of the purposes and powers of the corporation so as to provide that it shall be a gas and electric corporation within the meaning of the transportation corporations law and that its operations are to be carried on in the counties of New York, Queens, Kings, Richmond, Bronx, Westchester, Nassau and Suffolk."

Proposal to merge Consolidated Gas and affiliated companies into one gigantic organization is part of the plan to put into effect the Washington plan of promotional electric rates. Enabling legislation authorizing the merger of companies not 100 per cent owned is now being considered and is expected to be passed before the state Legislature adjourns at this session.

At the meeting, which was further adjourned until May 6, Floyd L. Carlisle, chairman of Consolidated Gas, told stockholders that by that time it was hoped that enabling legislation for the proposed merger will have been passed, so that other phases of the consolidation of the companies in the system can be taken up.

Following the issuance of press reports announcing sharp reductions in New York City's street lighting and public buildings electric bills, Senator John J. Dunnigan, chairman of the state legislative committee investigating public utilities, requested Mr. Carlisle to provide for general consumer utility services the same benefits. Senator Dunnigan put his demand in a letter to Mr. Carlisle, and in a statement declared that the same policy should be pursued by utility companies throughout the state. In response to Senator Dunnigan's letter Mr. Carlisle agreed to discuss rate reductions for general consumers with the Senator next week. In a special letter to the Legislature, asking for an appropriation of $300,000 for the Public Service Commission to insure continuance of the rate investigations, Governor Lehman this week sharply criticised utility companies for attempting to "balk effective legislation."

The latest charges brought by the joint legislative committee involved Howard C. Hopson of the Associated Gas & Electric System. At the recent hearings testimony was presented to show that he made $1,818,000 in profits over a six-year period for himself and his immediate family under contracts his private company, H. C. Hopson & Company, had with operating companies in the Associated system.

In the meantime the Senate, by a vote of 35 to 6, rejected Mayor LaGuardia's demand for specific legislation permitting New York City to build a power plant for city purposes with P.W.A. money without a referendum.

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Four Wisconsin Communities Reject Municipal Plants

Municipal ownership of utilities was defeated last week in four out of seven Wisconsin communities voting on proposals to establish municipal plants. Beaver Dam, Platteville, Tomah and Gillett discarded the referenda to establish municipally owned electric plants. Beaver Dam and Tomah defeated proposals to take over property of the Wisconsin Power & Light Company and Platteville voted 1,184 to 717 against acquiring the plant of the Interstate Light & Power Company.

Gillett voted 223 to 175 against acquiring the property of the Wisconsin-Michigan Power Company.

Ashland voted in favor of purchasing the water works of the Wisconsin Hydro-Electric Company, while Suring and Poynette balloted in favor of municipal electric plants.

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Works-Relief Bill Signed by President Roosevelt

On the special train carrying him from Jacksonville, Fla., to New York, President Roosevelt on April 8 signed the $4,800,000,000 works-relief bill which places in the hands of the Chief Executive broad powers to spend an unprecedented grant of money. The total embraces $4,000,000,000 in a new sum and $880,000,000 in existing balances of the R.F.C. and the P.W.A. The fund is earmarked in eight general classifications, covering almost every kind of public works. Rural electrification has been allotted $100,000,000.

T.V.A. Policies Hit at House Hearing

Willkie proposes four amendments to T.V.A. Act — Bituminous coal industry condemns Government projects — Pettengill framing new legislation

Testifying on the McSwain bill that would clarify the T.V.A. Act and enlarge some of the Authority's powers, Wendell L. Willkie, president Commonwealth & Southern Corporation, told the House military affairs committee last week that his company could pass on $30,000,000 in savings to electricity consumers under a financing method such as is available to the Tennessee Valley Authority.

Mr. Willkie proposed four amendments to the act: (1) That the T.V.A., where there are existing facilities, shall not sell its services, retail or wholesale, without buying or condemning existing facilities; (2) that T.V.A. shall comply with the uniform system of accounting of the National Association of Railroad and Utilities Commissioners, with which private utilities must comply; (3) that T.V.A. shall charge high enough rates to produce for the government a fair rate of return on its electric generating, transmission and distribution systems; (4) that T.V.A. file rates with the power commission, must not discriminate between classes of consumers, and rates must be uniform in towns served.

In appearing on behalf of the bill, Arthur E. Morgan, T.V.A. chairman, told the committee the gigantic Tennessee Valley program offered possibilities of developing one of the world's greatest industrial centers and of cutting 600 miles from the water route between Central United States and the Gulf of Mexico. He asserted the single integrated plan bringing power, navigation and flood control under the T.V.A. also would make each phase of the work much cheaper and more feasible.

In a letter addressed to Representative Thom of Ohio, President Roosevelt had previously denied that the T.V.A. was attempting to persuade Northern industries to move to the valley area, charging that "special interests are constantly attempting to thwart the program which Congress has set up for the Tennessee Valley."

The bituminous coal industry also entered the fray. John D. Battle, executive secretary of the National Coal Association, told the House military affairs com-

mittee that government subsidized hydropower would be disastrous to the bituminous coal industry and endanger the jobs of 400,000 miners. He charged the bills to amend the T.V.A. Act were especially designed to circumvent the Grubb decision.

E. A. Yates, vice-president and chief engineer of the Commonwealth & Southern Corporation, appearing before the committee, said that there is no truth whatever in the assertion that the Tennessee Valley area is dependent for electric power upon government-constructed projects.

Legislation to open up to state and municipal taxation all of the electric power developments of the federal government is being drafted by Representative Pettengill of Indiana. The loss of revenues to local governmental bodies through the operations of the federal government is becoming acute in certain sections of the Tennessee River Valley, Mr. Pettengill declared, pointing to the pending Taylor bill which would reimburse certain counties in Tennessee for loss of their taxes. "I have no objection to, and I approve of, the federal government exercising control over the great water power resources of the country," Mr. Pettengill declared. "However, this does not mean that the federal government should build dams and generate power. The government can lease the property, under restrictions, to private companies.

Holding Company Bill Hearings Concluded Before House Committee

Program for federal legislation presented by Willkie — Lilienthal interrogated on activities of T.V.A. — Utility executives oppose elimination — N.E.M.A. files brief — Senate hearing set for April 15

House committee hearings on the Wheeler-Rayburn holding-company bill, which have extended over more than seven weeks since February 19, were concluded this week. Consideration of the new legislation before the Senate interstate committee, originally scheduled to commence on April 8, has been postponed to April 15.

Proposals which took the form of specifically suggested amendments to the securities act, the securities exchange act, the revenue acts of 1926 and 1934 and the federal water-power act and looking toward the reasonable federal regulation of public utility holding companies and operating companies were submitted April 2 to the House interstate and foreign commerce committee by Wendell L. Willkie, president of the Commonwealth & Southern Corporation. Details of the amendments proposed by Mr. Willkie appear on page 31.

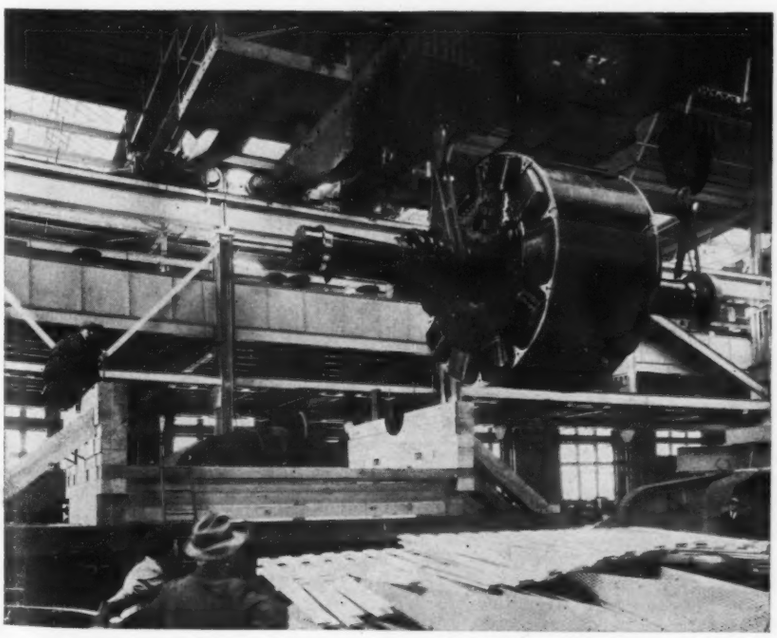
Declaring that passage of the Wheeler-Rayburn bill would seriously retard recovery in the electrical manufacturing industry, B. W. Kerr, representing a committee of the board of governors of the National Electrical Manufacturers' Association, at an earlier session presented a brief pointing out that "full recovery of employment in the electrical manufacturing industry is largely dependent upon sales to public utilities and upon their ability to purchase needed equipment. Sales to the public utilities represent almost the entire business of approximately one-third of the manufacturers of electric power equipment. This part of the industry has been severely depressed and many of these manufacturers lack the resources to carry them much longer through the continued depression." Mr. Kerr further stated that there is imminent need for increased generating capacity to provide for the demand expected in two or three years, and that if the public utilities are to provide for this imminent demand they will have to begin purchasing additional generating and distributing equipment immediately.

President Louis H. Egan of the Union Electric Light & Power Company, North American Company subsidiary, urged the House committee to throw Title II of the Wheeler-Rayburn bill "out of the window," pointing out that his company, as an example, was already regulated by city councils, two state public service commissions, the War Department and the Federal Power Commission. Similarly, President S. R. Inch of Electric Bond & Share Company, discussing the possible contribution to business recovery by unhampered gas and electric utilities, had pointed out that the customers of their associated companies had been saved over $64,000,000 in rate reductions since 1929 and in spite of the depression that has since prevailed.

First Vice-President W. Alton Jones of the Cities Service Company declared that in his opinion the passage of the Wheeler-Rayburn bill in its present form would result in the withholding of service from millions of people who under the holding company system could be supplied; would inevitably result in increased rates and lowered standards of service; would in no manner add to the protection of investors in public utility securities, and in many instances actually result in the serious impairment, if not complete destruction, of those investments.

Testifying for the Investment Bankers' Association of America, Vice-President Francis E. Frothingham of the invest-

CRANES DROP 367,000-LB. LOAD INTO PLACE



What is believed to be the heaviest single-car shipment ever made left the Schenectady Works of the General Electric Company recently for its destination at the Potomac Electric Light & Power Company at Benning, D. C. The load consisted of a generator shaft, rotor and poles for a 25,000-kw. frequency converter set, with a total weight of 367,000 lb., which will be used to deliver 25-cycle, single-phase power to the Pennsylvania Railroad.

ment banking firm of Coffin & Burr, Inc., Boston, insisted that the U. S. Government is probably "the greatest holding company of them all, making use of practices for which the private holding company has been freely condemned."

Concerning himself primarily with Title II of the bill, Bernard F. Weadock, vice-president and managing director of the Edison Electric Institute, analyzed the local character of the power business and pointed out that the regulatory powers given the Federal Power Commission under this section of the proposed legislation would very effectively terminate the private management of operating companies.

Vice-President Frederick S. Burroughs of Associated Gas & Electric Company took particular exception to much of Judge Robert E. Healy's earlier testimony with respect to Associated Gas & Electric's operations and disputed many of the conclusions that had at that time, or subsequently, been drawn from that evidence.

President Henry I. Harriman of the U. S. Chamber of Commerce, while testifying in support of the basic principles of the Wheeler-Rayburn bill, went on record as opposing the drastic dissolution features of the proposed legislation; suggested nine amendments which would modify the more severe conditions, make more workable the others.

Lilienthal forced to the defensive

In 1929, publicly praising holding companies, David E. Lilienthal said: "Isolated plants have given way to great systems whose lines span several states and serve hundreds of communities, all operated under unified managerial and financial supervision. . . The spread of rural electrification, the amazing advances in telephony, the rise of superpower systems—these and many other technological developments so intimately related to the public welfare are directly attributable to the efforts of the holding company. . . Perhaps most important of all, to the holding company must go the credit for the unprecedented flow of capital into the public utility industry, making possible extensions and improvements of service."

In 1935 Mr. Lilienthal appears before the House interstate committee confident that he can show how power rates could be reduced 50 per cent if holding companies were exterminated. Instead, however, he was forced to the defense of T.V.A. policy by wholesale demands from committee members for an explanation of the extent and scope of its activities, whether predicated on national defense needs or upon the development of surplus power with which to compete with utilities within and without the Tennessee Valley. In a markedly hostile cross-examination, Mr. Lilienthal was criticised for sponsoring legislation regarded as an attempt to put reverse English on Judge Grubb's recent decision and for engaging in activities under Delaware charters which many of the congressmen construed as going far beyond the intent of the Congress in passing the T.V.A. Act.

H. Lester Hooker, chairman of the legislative committee of the National Association of Railroad and Utilities Commissioners, put the association on record as being definitely opposed to that section of the holding company bill which calls for the dissolution of the companies, and advanced "violent objections" to the sections regulating operating companies.

Describing T.V.A. as a "bureaucratic adventure into wonderland," Dr. Hugh S. Magill, president of the American Federation of Utility Investors, demanded that a halt be called on government invasion of the power industry. Senator Wheeler, co-author of the Wheeler-Rayburn bill, in a radio talk delivered Monday evening, April 8, made pointed reference to ELECTRICAL WORLD and its championing of the cause of the industry it serves.

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To Expand Research Work

Charles Edison, president of Thomas A. Edison, Inc., West Orange, recently announced the formation of an engineering committee to co-ordinate the research work and engineering projects of the widely diversified Edison Industries. E. D. Martin, vice-president of Thomas A. Edison, Inc., will serve as chairman of the committee.

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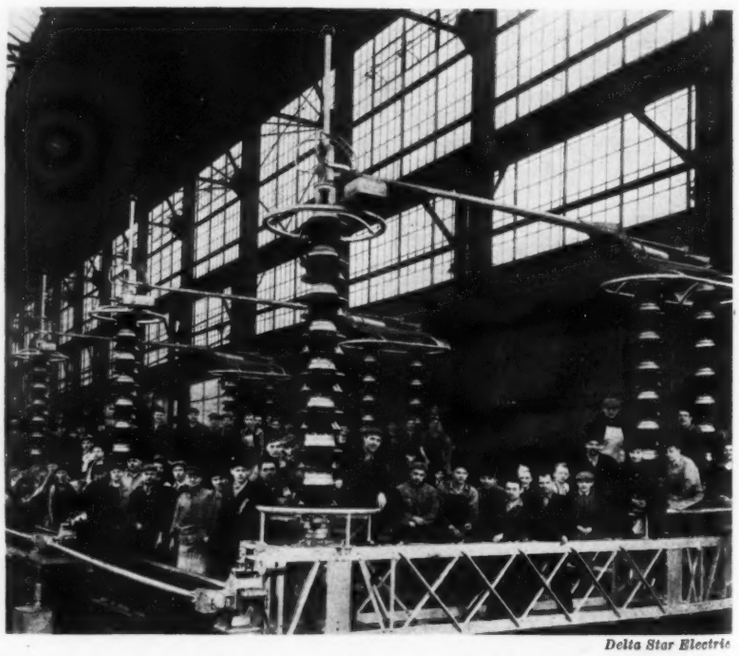
Legal Action Requested on Flathead Power Project

In a formal order announced last week the Federal Power Commission requested the Attorney-General to take appropriate legal action against the Rocky Mountain Power Company for failure to comply with the terms of a license issued in 1930 for construction of the Flathead power project on the Flathead River in Flathead and Lake Counties, Montana. The commission in the same order denied the company's petition for an extension of time to 1938 for completion of the project. The Secretary of the Interior recommended denial of both petitions of the company for extension, holding that the proposals of the company did not give adequate protection to the interests of the Flathead Indian Tribe, whose reservation is affected.

As licensed, the project included a concrete dam 150 ft. high across Flathead River, 4 miles below the outlet of Flathead Lake, and a power plant with an initial installation of three 50,000-hp. units, with provision for the future installation of a fourth unit.

DISCONNECTS FOR BOULDER DAM LINE



Delta Star Electric

Sixteen sets of these 287-kv., 1,200-amp., motor-operated, disconnecting switches are being built for use at the terminals and two sectionalizing stations of the Boulder Dam-Los Angeles line. Each set weighs 15 tons, but is so perfectly balanced that it can be opened by hand. The overall height of the switches when open is 28 ft., phase spacing between poles 22 ft. Insulator posts are by Ohio Brass.

National Power Survey Analyzes Future Requirements of Nation

Report shows expected increase in demands for power upon resumption of pre-depression activity — Estimates based on 215 major systems — Indicates shortage in all zones

"Although pre-depression industrial activity and purchasing power have not yet been reached, indications are that these may occur fairly soon, carrying with them increased demands for electricity," the National Power Survey of the Federal Power Commission points out in its second installment. A résumé of the first installment of the survey appears on page 35.

"During 1934 power requirements showed a rapid increase in almost every section of the country," the survey shows. "Power generated during January, 1935, was 10 per cent in excess of that for the previous January and was approximately equal to the amount generated during January, 1929. If the persistent growth in demand for power experienced during the past two years continues during this current year, power generation for 1935 will exceed 1929 and establish a new all-time record."

Basis of the survey's estimates

To establish quantitatively the amount by which power requirements will exceed the previous maximum, the survey made special investigations of residential power consumption, rural electrification, commercial and industrial uses of power, additional and new uses for power in electrochemical and electrometallurgical processes and the requirements of railroad electrification. Power sales and maximum demands by major classes of service were determined from reports submitted by the 215 major systems which represent approximately 92 per cent of the total farm service of the country, 86 per cent of the residential and domestic service and 96 per cent of the total energy consumed by other classes of customers. Consumption in 1929 and estimated future demands follow in thousands of kilowatt-hours:

	1929	Future
Farm	1,503,000	2,069,000
Residential and domestic	7,957,000	13,093,000
Small light and power	10,636,000	13,014,000
Large light and power	40,255,000	43,800,000
Municipal street lighting	1,556,000	2,335,000
Municipal light and power	1,443,000	1,966,000
Street and interurban railways	4,833,000	4,265,000
Electrified steam railroads	520,000	1,390,000
Miscellaneous	2,730,000	3,415,000
Total	71,433,000	85,347,000

The report concludes that: the dependable capacity of the 215 systems surveyed is 27,300,000 kw., or 14 per cent less than the installed capacity; a minimum spare capacity of 3,917,000 kw. is needed to assure adequate service for the loads estimated; an additional leeway or greater reserve of 10 per cent of the estimated peak demands in addition to the minimum spare capacity is reasonably required; with resumption of pre-depression activities as much as 2,000,000 kw. of capacity that is inadequate or has become obsolete may need to be replaced.

Power shortage in all zones

Based on its estimates of future demands for power, its studies of existing generating plants, obsolete equipment needing replacement and reserves required for adequate service and future growth in load, the survey in a third installment discusses the surplus and deficit of dependable generating capacity that will be required upon resumption of pre-depression industrial activity.

Shortages of capacity, the report finds, are indicated in some part of every power zone, the total shortages, if a leeway for growth of load is added, being estimated at 2,325,000 kw. Surpluses are also found in some parts of all but one of the zones, but owing to location or lack of transmission facilities cannot necessarily be used to offset the shortages. Based on the conclusions regarding obsolescence of plant equipment, this will increase the total gross requirements of new capacity to 4,000,000 kw. A map has been prepared by the survey which indicates by the shading of areas the various districts in which the return of normal industrial activity will create surpluses or deficits.

Manly replies to Weadock

Replying to the attack made by Bernard F. Weadock, vice-president of the Edison Electric Institute, on the National Power Survey's estimates of power shortages that may exist upon the resumption of pre-depression industrial activity (page 35), Vice-Chairman Basil Manly, commissioner-in-charge of the survey, said: "The attack of the Edison Electric Institute on the facts established by the National Power Survey of the Federal Power Commission fully demonstrates the institute's lack of knowledge and accurate information regarding the industry it purports to represent.

"The institute claims that the electric utilities are prepared to meet the demands for power that a return of pre-depression industrial activity will create. This absurd claim is at variance not only with the findings of the commission, based upon the reports of the companies themselves, but also with the estimates of the leading authorities of the industry.

"The ELECTRICAL WORLD in its issue of March 30, 1935, published the findings of its engineers that the industry could and should spend $876,800,000 in generating stations alone to enable it to supply the coming demand for power. This is nearly three times the commission's estimate of $300,000,000 as the minimum that will be required.

"Recently also W. J. Hagenah, an engineer and official of the Standard Gas & Electric Company, has estimated at $2,000,000,000 the amount of expenditure which should be made by the industry for new generating capacity and for extension of transmission and distribution facilities . . . The fact is that the shortage estimates arrived at by the Power Survey are ultra-conservative. They are fully confirmed by the findings of those companies which have made detailed engineering surveys of their own prospective power demands. The published report, which will be ready for distribution within a day or two, speaks for itself and fully answers all the technical questions raised by the Edison Electric Institute as a result of its complete misunderstanding of the scientific methods utilized by the survey in its determination of the nation's power requirements and available, dependable generating capacity."

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Electrification Completed

Conversion from steam to electric operation of its entire regularly scheduled through and local passenger service between New York, Newark, Philadelphia, Wilmington, Baltimore and Washington was completed this week by the Pennsylvania Railroad. The change has been made progressively over a period of eight weeks, beginning with February 10. The completely electrified passenger service embraces 639 daily trains. Electric operation of the freight service between Washington and New York is expected to be initiated within the next few weeks and will include 47 trains.

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Winnipeg Hydro Deficit

City of Winnipeg Hydro-Electric System showed a net deficit of $301,151 in 1934, after all charges, including interest and depreciation, comparing with a deficit of $357,400 in 1933. Although gross income was higher and operating expenses slightly lower than during the preceding year, interest, depreciation and other charges absorbed $2,349,564, leaving the net deficit as indicated. The year's loss brought total deficit account up to $612,370.

Ontario Bill Voids Quebec Power Pacts

Legislature passes bill introduced by Premier Hepburn affecting four Quebec utilities — Measure creating Hydro-Electric Commission for Quebec introduced

After thirty-seven hours of continuous session, the Ontario Legislature passed the bill introduced by Premier Mitchell Hepburn repudiating power-purchase contracts negotiated by the former Hydro-Electric Power Commission with four Quebec power companies (ELECTRICAL WORLD, March 16, page 42). The bill, entitled the Hydro-Electric Power Commission Act, 1935, declares contracts with the Gatineau Power Company, Beauharnois Light, Heat & Power Company, Ottawa Valley Power Company and the Maclaren-Quebec Power Company were "illegal, void and unenforceable." Premier Hepburn refused, after adjournment, to reveal the government's intentions, but said the first task was to get the bill through and the next move would be up to the bondholders.

Ontario, however, will continue to purchase power from Gatineau under the existing contract, the Premier said, but will not be bound by the terms of the contract. The contracts with the other three companies will be terminated on a day to be named later. The government contends that the contracts were negotiated by the commission without the consent of the municipalities it served, contrary to the power commission act and without regard to the provisions of the British North America act.

It was also contended that the contracts obligated the commission to purchase over a long period of time "large quantities of power generated without the Province of Ontario regardless of whether or not the said power was desired."

Events have also been moving rapidly in the Province of Quebec. Based on recommendations contained in a report made to the government by the royal commission last year, two new government measures have been introduced into the Quebec Legislative Assembly by Premier Taschereau. One is designed to enlarge the scope for the municipalization of electric light and power services and the other to create a permanent commission to control and regulate all the phases of Quebec's hydro-electric systems, whether municipally or privately owned.

•

Harley Clarke Refused Note Extension by R.F.C.

Announcement has been made by the Reconstruction Finance Corporation through Jesse H. Jones, chairman, that it does not plan an immediate effort to foreclose on the operating companies involved in the seizure of the Public Utilities Securities Corporation, the Harley L. Clarke holding company (ELECTRICAL WORLD, March 20, page 125). This disclosure was made when R.F.C. refused to extend the $2,000,000 note of the Public Utilities Securities Corporation, which it had secured when it made a loan to the Central Republic Bank & Trust Company of Chicago in 1932. Mr. Jones explained that it was the policy of the corporation to keep such notes in a past-due condition for better control of the collateral.

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Utility Yardstick Proposed for Monongahela Basin

With the T.V.A. under sharp attack in Congress, a presidential committee this week recommended that privately owned utilities be invited to make ten counties in northern West Virginia, lying almost entirely in the watershed of the Monongahela River, a yardstick to measure the ability of private capital to uplift a benighted area, socially as well as industrially.

Submitted last November 7, after eight months' work, by a committee composed of three members, the report has just been referred by the President to the National Resources Board this week.

Frankly recognizing that the possibility of more rigid regulation by state authorities and the current legislation directed at the elimination of holding companies might well be deterrents to the investment of any considerable amounts of private capital in such an enterprise, yet the committee, two to one (Chairman Chapman dissenting), insisted on offering privately owned utilities the "first crack" at developing the necessary power resources. Two other courses were suggested as alternatives, should private enterprise decline the invitation. One, the establishment of a mixed corporation, representing both public and private capital, and subject to regulation as to profits, charges and services; the other the creation of a local power authority similar in character to the T.V.A., financed by public funds entirely and exercising the powers of eminent domain.

Situated in the Upper Monongahela Valley, the ten counties to be rehabilitated cover 4,447 square miles, have a population of 340,250, include 92 "stranded" communities, all but three of which are single-industry towns. Such activity as there is is predominantly mining or agricultural.

As for available water-power sites, a survey, initially completed in 1931 and now being revised, made by the U. S. Engineers Office in Pittsburgh, indicates three possibilities of consequence: (1) The Youghiogheny River; (2) the Cheat River; (3) the Upper Monongahela River Basin (Tygart power project). The preliminary survey indicates a potential 237,580 hp. could be harnessed for $96,607,000 on the Cheat River and an additional 73,640 hp. for $47,611,980 on the Tygart River.

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Power Authority Advocates State "Grid" System

Co-ordination of all the power-generating facilities in the state, through a state-controlled transmission system, was urged last week by the Power Authority of the State of New York in its annual report to the Legislature. The state-controlled transmission scheme, modeled, the report stated, after the English "grid system," would divorce the production of power from its sale. It would operate as a common carrier, buying the energy wholesale, selling it for distribution, and thus virtually fixing the retail rates. Scrapping of the present system of rate regulation is involved, the report indicated.

Consideration of the following legislation at the next session of the Legislature was recommended by the Authority: (1) Amendment to the law to authorize the Power Authority to construct, own and operate transmission lines to connect with the various municipalities, which, under the municipal utility bill, may vote to operate their own electric systems; (2) enactment of legislation authorizing the creation of power districts, so that cities, villages and rural areas may combine to assure all homes and farms in the state the full advantages of public competition.

COMING MEETINGS

American Institute of Electrical Engineers—Southwest District, Oklahoma City, Okla., April 24-26. H. H. Henline, national secretary, 33 West 39th Street, New York.

Missouri Association of Public Utilities—Annual meeting, Kansas City, Mo., April 25-26. Jesse Blythe, assistant secretary, 101 West High Street, Jefferson City, Mo.

American Physical Society — Annual meeting, Washington, D. C., April 25-27. H. W. Webb, acting secretary, Columbia University, New York, N. Y.

National Electrical Manufacturers Association — Spring meeting, The Homestead, Hot Springs, Va., May 20-23. W. J. Donald, 155 East 44th Street, New York.

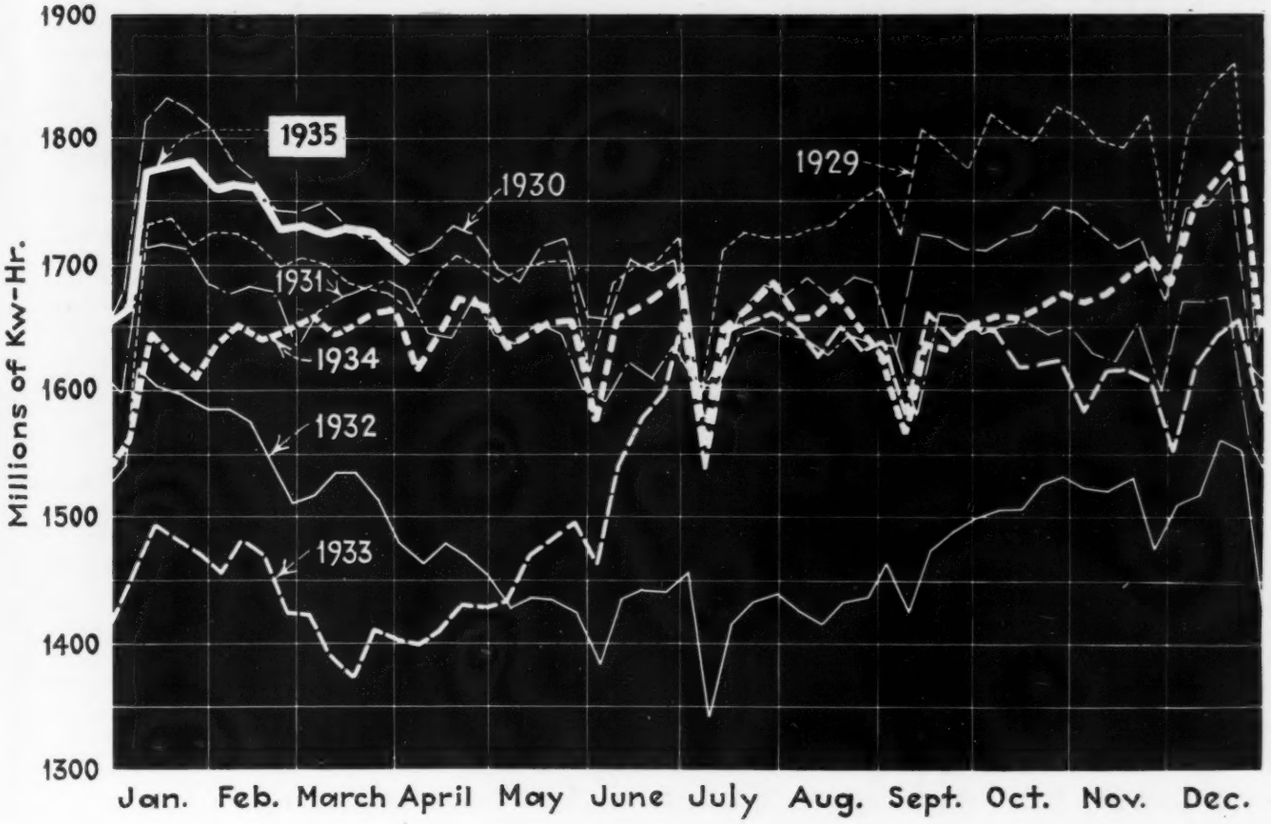
National Battery Manufacturers Association — Spring meeting, Hollenden Hotel, Cleveland, Ohio, May 22-23. W. J. Parker, commissioner, 7 East 44th Street, New York.

Edison Electric Institute — Mayflower Hotel, Washington, D. C., June 1-6. B. F. Weadock, 420 Lexington Avenue, New York.

American Society for Testing Materials — Annual meeting, Book-Cadillac Hotel, Detroit, Mich., June 24-28. R. E. Hess, assistant secretary, 260 South Broad St., Philadelphia, Pa.

Canadian Electrical Association—Annual meeting. Algonquin Hotel, St. Andrews-by-the-Sea, N. B., June 26-28. B. C. Fairchild, secretary, 409 Power Building, Montreal, Que.

Output Running Even With Record Year



For two months the output of central stations has been virtually equal to that of the corresponding period of 1930, the year of the highest springtime production in the history of the industry. With the week of March 23 the 1935 curve crossed 1930, though by a narrow margin; during the past four weeks the two curves have, for practical purposes, been identical.

Compared with last year the production of 1,700,334,000 kw.-hr. reported by the Edison Electric Institute for the week ended April 6 shows a gain of 5.2 per cent, against 2.8 per cent in the preceding week and 4.0 per cent in the week before that. Operations are running steadily around 2 per cent above 1929.

A decline at this time of the year is normal; the noteworthy feature about the present seasonal decrease is that it is no steeper than that of 1929 and distinctly less pronounced than in 1930. If the lead over the former year, which now seems well established, is merely maintained it will result in record-breaking production next winter.

Domestic consumption is already on a higher level than ever before; retail commercial sales are close to the record; industrial use is well on the upgrade, having increased 40 per cent compared with the early part of 1933, and has about recovered parity with the like period of 1931 so that there remains abundant room for further growth before former values are restored.

Weekly Output, Millions of Kw.-Hr.

1935		1934		1933	
Apr. 6	1,700	Apr. 7	1,617	Apr. 8	1,399
Mar. 30	1,713	Mar. 31	1,666	Apr. 1	1,402
Mar. 23	1,725	Mar. 24	1,658	Mar. 25	1,410
Mar. 16	1,728	Mar. 17	1,650	Mar. 18	1,375
Mar. 9	1,724	Mar. 10	1,647	Mar. 11	1,391
Mar. 2	1,734	Mar. 3	1,658	Mar. 4	1,423

Per Cent Change from Previous Year

Region	Week ended Apr. 6	Mar. 30	Mar. 23
New England	+ 3.1	+ 1.1	+ 1.8
Middle Atlantic	+ 4.5	+ 1.0	+ 1.9
Central Industrial	+ 6.9	+ 3.5	+ 4.1
West Central	+ 7.7	+ 6.0	+ 3.6
Southern States	+ 8.1	+ 6.3	+ 8.0
Rocky Mountain	+17.2	+15.3	+17.3
Pacific Coast	— 5.2	— 4.9	— 2.2
United States	+ 5.2	+ 2.8	+ 4.0

U.S.G.S. Reports February Gain

Exceeding last year's figure for the month by 7 per cent, electric utility plants generated 7,508,000,000 kw.-hr. in February, against 7,631,000,000 kw.-hr. in January and 7,049,000,000 kw.-hr. in February, 1934. With the exception of 1930, the output was the largest for February in any year. It missed the record for the month by 1.5 per cent.

The average daily production was only slightly less than in January. Of the total output 40 per cent came from water power.

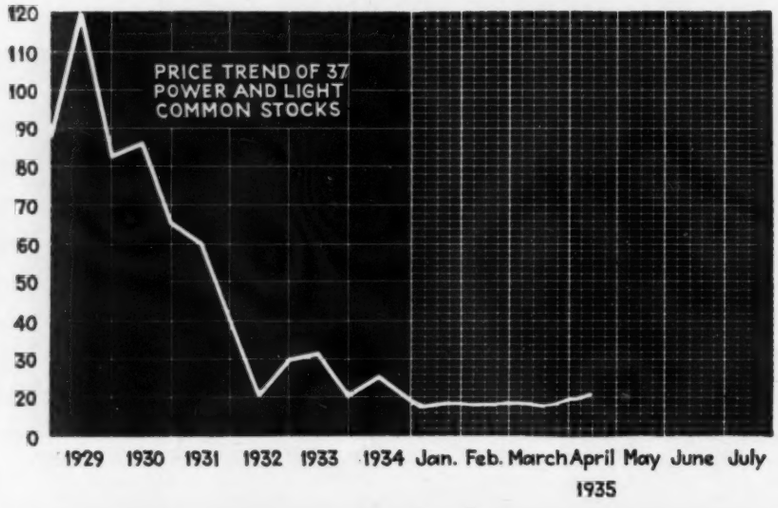
Percentage gains in the various geographic divisions, compared with like months a year ago, were as follows:

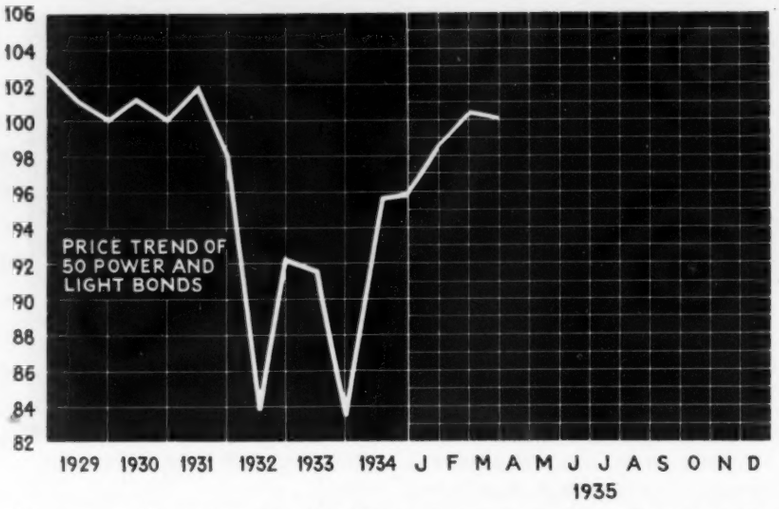
	Dec.	Jan.	Feb.
United States	+ 8	+ 9	+ 7
New England	+ 6	+ 9	+ 4
Middle Atlantic	+ 4	+ 7	+ 1
East No. Central	+ 5	+ 8	+ 6
West No. Central	+22	+21	+16
South Atlantic	+12	+ 9	+13
East So. Central	+27	+19	+17
West So. Central	+ 9	+ 9	+ 4
Mountain	+10	+ 7	+ 9
Pacific	+ 6	+ 8	+ 5

Big Air-Conditioning Order

Announcement has been made that a million-dollar government order for an air-conditioning installation has been awarded the York Ice Machinery Corporation of York, Pa. The contract, to be paid for by P.W.A. funds, provides for complete year-round air conditioning of the United States Department of Interior Building in Washington. The equipment, to be installed within 150 days, is expected to supply 500,000 cubic feet of conditioned air a minute.

Stocks Continue Gains; Bonds Lower





Advances in the prices of electric light and power stocks continued during the past week — "Electrical World" index, 20.5; last week, 19.9. Minor fluctuations in the bond list occurred in March — "Electrical World" index, 100.0; February, 100.4

Southern California Edison Lists $73,000,000 Issue

An issue of $73,000,000 of 25-year 3¾ per cent refunding mortgage bonds, the largest ever filed under the securities act of 1933, has been registered with the Securities and Exchange Commission by the Southern California Edison Company, Ltd. The new bonds will be issued under an existing refunding mortgage, will be dated May 1, 1935, will mature in 25 years, carry interest from July 1, 1935, at the rate of 3¾ per cent and be redeemable at a premium starting at 7½ per cent.

Proceeds from the sale of the mortgage bonds will be used to retire $13,400,000 of 5 per cent bonds due in 1939 and $55,000,000 of 5 per cent bonds due in 1951. In commenting on the issue Harry J. Bauer, president of the company, said: "After careful consideration the directors and officers of the company are entirely willing to accept responsibility for registering this very large transaction in the spirit of co-operating with the administration. Our experience has been that the 'Truth-in-Securities' Act, with its amendments, is workable and not unduly burdensome. The data required were always necessary in the past where financing was consummated with conservative banking firms. The penalties will compel every director to familiarize himself with the details of his company's affairs to a degree which has heretofore been unknown to most corporations. This cannot help but result in great value to corporations and their stockholders. . . . "

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Texas Units to Reorganize

Announcement has been made of the formation of a company to acquire all assets of the Galveston-Houston Electric Company and the Galveston-Houston Securities Corporation and all outstanding bonds of the Galveston-Houston Electric Railway Company under a plan of reorganization dated March 1 and filed in the federal court in Boston, Mass. The reorganization committee comprises E. D. Crowley, A. S. Pratt and M. W. W. Prowse, chairmen of protective committees for holders of notes and bonds of the companies.

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Electrical Industry Wages Have Increased

Thirty electrical manufacturing companies employing 38,231 persons increased the wages of 24,393 employees and reduced the compensation of 11,912, a survey made by the National Industrial Conference Board covering wage rates during the years 1933-34 revealed. The percentage of electrical concerns which granted increases was 96.7, while the percentage which made reductions was 15.7 per cent. The percentage of increase in wages was 28.1, while the percentage of reduction was 10.1. These figures compare very favorably with manufacturing industries as a whole. Of the 717 industrial manufacturing concerns included in the survey, which employ 525,629 persons, 87.7 per cent granted increases while 15.1 per cent made reductions.

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Duke Utilities to Merge

Plans for the merger of the Southern Public Utilities Company with the Duke Power Company, Charlotte, N. C., have been approved by the North Carolina Utilities Commission and the Duke company has petitioned the South Carolina commission for the same authorization in that state. Stanley Winborne, chairman of the North Carolina commission, said the commission had "only given approval of the plan for the merger as set forth in the petition"; that this is a preliminary move, and that the merger will take place later. E. C. Marshall, president of the Southern Public Utilities Company and vice-president of the Duke Power Company, explained that the merger is being planned to simplify operation and, more specifically, to prepare for refinancing of bonds of the Southern Public Utilities Company maturing this year.

New York Metal Prices

	Mar. 27, 1935 Cents per Pound	Apr. 10, 1935 Cents per Pound
Copper, electrolytic	9.00*	9.00*
Lead, Am. S. & R. Price	3.60	3.65
Antimony	14.50	14.00
Nickel ingot	35.00	35.00
Zinc, spot	4.25	4.35
Tin Straits	47.40	49.375
Aluminum, 99 per cent	19—21	19—21

*Blue Eagle.

Voltage PROFITABLY on the System....

From Generator Through to the Consumer

The 8-POINT PLAN Offers an Economical Solution for All of Your Voltage Regulation Problems

THE 8-POINT PLAN for Profitable Voltage Regulation offers you an opportunity to improve voltage at a profit. It provides new and improved equipment for the solution of every regulation problem.

The Problem

The problem of voltage regulation is today of major importance. It has been made increasingly complex by the addition and extension of urban and rural branch feeders, and the increasing load in all areas, including those fringe areas which heretofore represented almost negligible loads and low load densities. Furthermore, the induction regulators at your stations, while doing a good job in the areas of high load density, cannot improve, simultaneously, voltage conditions in the light-load areas, and regulators of this type are not economically justified for the areas of light load.

The Solution

Voltage can be completely regulated throughout a large area by dividing the area into sections and making the final adjustment of voltage for each section individually, so that the measure of regulation is determined by the maximum voltage change between the first and last customer in each section. To do this job economically, several regulating devices are required.

Such a comprehensive line of voltage-regulating devices is presented by the 8-POINT PLAN. In it, General Electric provides equipment for solving all of your voltage regulation problems in a way which will increase revenue and release feeder capacity for additional loads.

Ask for the Complete Plan

We have prepared a folder which covers the complete 8-POINT PLAN. It contains a bulletin which points out how the plan can help you to increase revenue, and an individual-product leaflet which gives the application and economics story on each of the eight devices. You may obtain a copy by addressing the nearest G-E sales office, or General Electric, Dept. 6D-201, Schenectady, N. Y.

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Research Works Advanced by A.S.T.M. Group Meetings

Out of the 130 sessions of committee groups during the recent regional meeting of the American Society for Testing Materials in Philadelphia come several items of interest to the electrical industry. It was agreed by Committee A-1 on Steel that specification requirements are to be drafted covering electric-resistance welded boiler tubing. Included in the list of steels suitable for welding of the committee on welding will be the specification for high tensile strength carbon steel plates (A-149 and A-150). An extensive test program is planned to disclose the effect of carbon and manganese on weldability.

Action was taken to recommend the adoption as standard of the existing tentative recommended practice for safeguarding against embrittlement of hot-galvanized structural steel products (A-143) and the procedure for detecting embrittlement (32T).

The subcommittee on corrision testing has been giving consideration to the possibility of undertaking atmospheric exposure test of metals. The program comprises work to improve the test methods previously studied by the subcommittee, which included the salt spray test, the boiling nitric acid test and the copper sulfate stain test.

Approval for submission to committee ballot were important revisions in the standard specifications for bare concentric-lay copper cable which will provide new requirements for testing this type of cable in its completed form as against the present practice of testing individual wires. A new stranding table will be incorporated and it is expected to have the support of the Insulated Power Cable Engineers Association and the sectional committee on insulated wires and cables. The B-1 committee has new data on the use of soft versus hard wire cores in transmission cable. Accelerated aging tests for insulating tape are being perfected and a co-operative program is being carried out to correlate test methods for testing friction and rubber insulating tape.

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Standard Gas Seeks to Extend Maturing Notes

Elimination of the gold clause from $24,649,500 of 6 per cent gold notes and from trust agreements under which they were issued was provided for in a registration statement filed recently under the Securities Act by the Standard Gas & Electric Company of Chicago for the deposits of the securities in connection with a plan by which their maturity would be extended from Oct. 1, 1935, to Oct. 1, 1940. The notes are in two series, $14,823,000 issued in 1915 and $9,826,500 in 1931, the latter bearing the conversion privilege.

The effect of the plan will be to extend, at the same interest rate, for another five years the date on which the notes must be met and to make them redeemable in legal tender at the option of the issuer on any of the interest payment dates after Oct. 1, which fall on April 1 and October 1 of each year.

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Niagara Hudson Elects New Directors

Three vice-presidents of the Niagara Hudson Power Corporation having charge of its three operating divisions were elected directors of the corporation. The new directors are Col. William Kelly, president of Buffalo, Niagara & Eastern Power Corporation; Stefaan Piek, executive vice-president of the Syracuse Lighting Company, Inc., and Otto Snyder, president of New York Power & Light Corporation. John E. Zimmermann, president of the United Gas Improvement Company, has resigned as a director.

•

Engineers Plan to Advance Status of Profession

Metropolitan sections of five national engineering societies, representing electrical, civil, mechanical, chemical and mining engineers, met recently in the Engineering Societies Building, New York, to hear four eminent engineers discuss the aims and achievements of the Engineers' Council for Professional Development. Gano Dunn, president of the J. G. White Engineering Corporation, and recently elected chairman of the board of trustees of Cooper Union, presided. The speakers were Dr. C. F. Hirshfeld, chairman of the council and chief of research of the Detroit Edison Company; General R. I. Rees, chairman of the council's committee on professional training and assistant vice-president of the American Telephone & Telegraph Company, and Prof. J. W. Barker, member of the council's committee on professional recognition and dean of the school of engineering of Columbia University.

Referring to the apparent diversity of engineering occupations, which has followed in the wake of science and invention, Mr. Dunn emphasized the essential unity of all engineers in their methods of attacking problems. "I see in the Engineers' Council for Professional Development," he said, "the dawn of a professional self-conscionsness among engineers, the effects of which on the engineer's status in society and on his satisfactions in life may be profound. The council," he added, "rests upon and derives its strength from the whole profession."

Los Angeles Prepares to Take Boulder Dam Power

Construction work, estimated to cost $769,810, on the Los Angeles, Cal., municipal electric system in preparation for receiving Boulder Dam power has been authorized by the city's Board of Water and Power Commissioners. Of this amount $395,810 will be expended for betterments, extensions and replacements on the system, including overhead and underground wiring and additions to distributing stations. This work is already under way. The proposed work will include construction of a distributing station at Eagle Rock to cost, with electrical equipment installed, $241,000. Work on a similar station in the Pacific Palisades district will cost $133,000.

On the Boulder Canyon power transmission system practically all the steel towers have been erected, from the damsite on the Colorado River to within 40 miles of Los Angeles, according to E. F. Scattergood, chief electrical engineer and general manager of the Bureau of Power and Light at Los Angeles. Work of erecting the double circuit towers from a point west of Cajon Pass to a connection with the system in Los Angeles soon will be started.

•

Sacramento Wins Bond Suit

In a decision handed down recently in the Superior Court of Plumas County, California, Judge J. O. Moncur overruled demurrers filed by the Pacific Gas & Electric Company and Dr. Frank P. Brendel, taxpayer to the $12,000,000 bond issue voted by the Sacramento Municipal Utility District (ELECTRICAL WORLD, March 2, page 54). The court allowed twenty days for an answer.

•

Rex Cole to Reorganize

Rex Cole, Inc., has sought permission in the federal court in New York to reorganize its business under provisions of Section 77b of the Bankruptcy Act. A petition filed with the court explained that an excess of current liabilities over current assets and the burden of numerous unfavorable leases had made it impossible, under the circumstances, to continue the business profitably.

•

International Conference

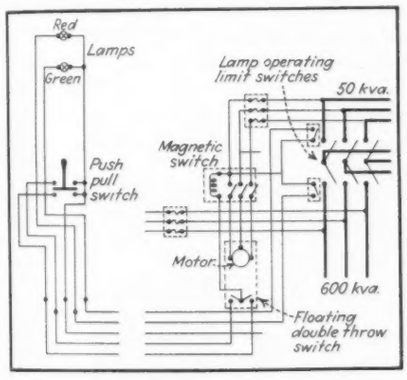
Arrangements are now under way for the International Conference on Large Electricity Distribution Systems, which is to be held in Paris from June 6 to 15 under the auspices of the International Electrotechnical Commission. The conference is open to representatives of electrical engineering undertakings, government engineers, professors, scientists and consulting engineers.

Switch Converted to Motor Operation

By W. S. WEAVER

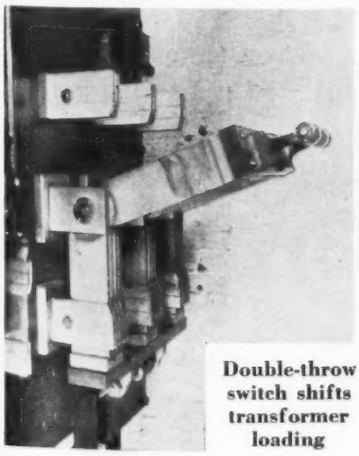
The Hoover Company,
North Canton, Ohio

To eliminate the relatively large core loss on the 600-kva. transformer bank in one of the substations at the Hoover vacuum cleaner plant the night load is shifted to a 50-kva. bank. It was desired to avoid the expense of two motor-operated air breakers and at the same time to put the switching operation under remote control from the main switchboard at the power house. The position in which the switch is thrown is indicated by means of red and green lamps mounted on the main board. Each is connected across a single-pole limit switch, the switches being located at the top and bottom of the main switch in such a manner that when one side of main switch is closed it will make physical contact with the limit switch.



Substation knife switch thrown from main board

Night load shifted to smaller transformer bank to save on core losses.



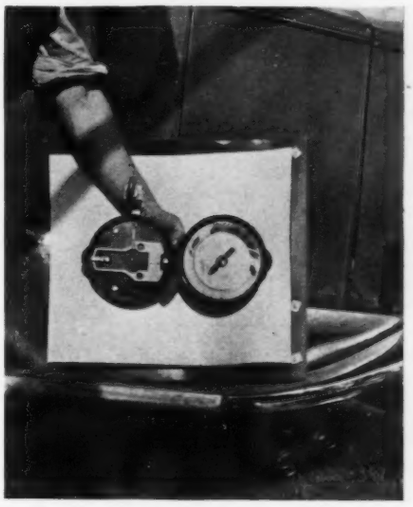
Double-throw switch shifts transformer loading

Motor-operated and by remote control. Operating rod attached in place of lower handle. Slot cut in panel to accommodate the rod. 1,500-3,000 amp., 230 volts.

•

"Taxi Meter" Records Line Vibration

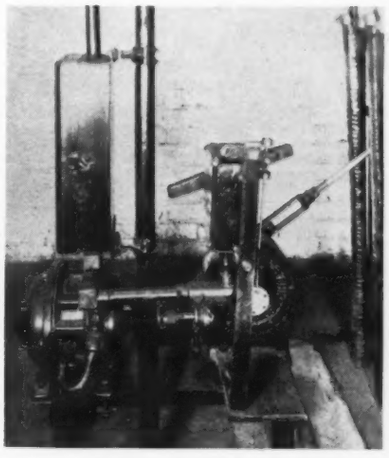
Adapting a device which was developed for use by the owners of fleets of commercial vehicles to record hours of operation, engineers of the Pacific Gas & Electric Company have developed a simple, light-weight conductor vibration recorder. Originally intended for recording the hour's use of a vehicle by charting the vibration due to motion of the vehicle, the device operates on an inertia principle. As used by the P.G.& E. engineers, the aluminum yoke, shown in the accompanying illustration, floats on a pivot point at the extreme left. Its motion is retarded by a spring attached to the lower left-hand corner. A stylus is mounted on the extension to the yoke, as shown in the upper center.



Vibration meter provides reliable record of conductor oscillations

Mounted in the cover on the right is a clock-driven chart. When the cover is closed the chart is in contact with the stylus and, if the device is in a state of rest, a smooth curve will appear on the chart. However, attached to a vibrating body, the motion of the container about the stylus completes a record of the movement.

The recorder is hung on the hot conductor at any point and faithfully records periods of vibration to actual scale. As it is entirely mechanical there are no electrical connections to be made and its simplicity and reliability have made it an extremely useful tool in studying transmission line conditions.



Motor and reducing gear operate knife switch

Worm gear, driven by a ½-hp. induction motor, imparts reciprocating motion to operating rod. The limit of the switch is determined by a cam at the opposite side of the worm gear, which in turn operates a floating double-throw switch to leave the circuit closed for the reverse operation.

•

Reclaiming Old Boiler Tubes

By C. M. TAYLOR

Lincoln Electric Company, Cleveland, Ohio

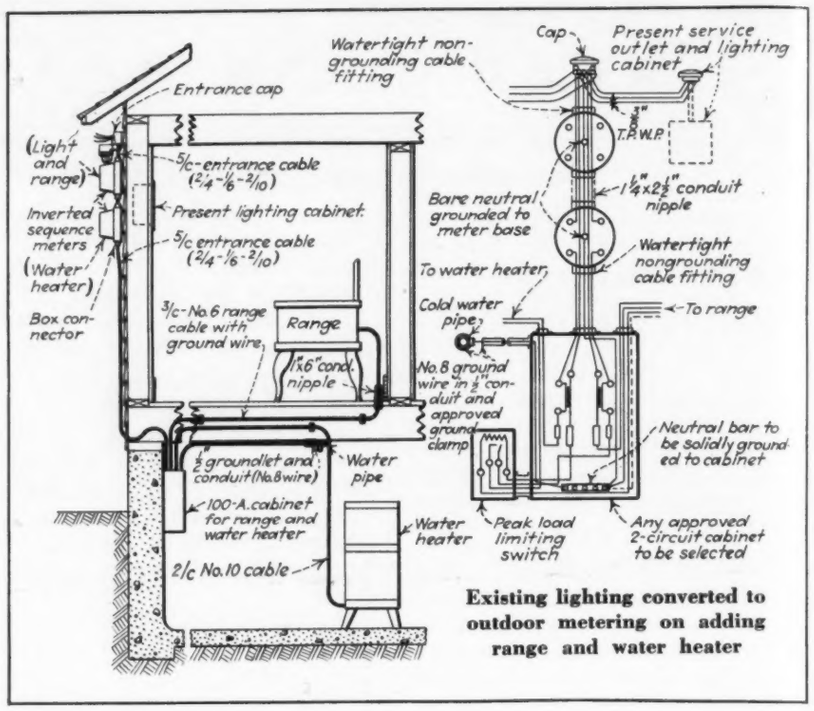
Discarded pipe and oil boiler tubes in considerable quantity were saved from the junk pile and turned to a more useful destiny in the plant of the Florida Light & Power Company at Dania, Fla. These pipes and tubes,

past service in their original purposes, are now used in oil lines. Oil-line pressures are not high and material that may not carry water or steam can very safely be employed. It was arc welding that made this economy possible. Had it been necessary to buy new couplings and fittings and cut and thread the assorted odd lengths of pipe into the dimensions of the oil system it would have been cheaper to use new pipes. But welding obviated the need for couplings and for many other fittings as well. So it was less costly to build up the system by means of the electric arc.

•

Inverted Sequence Metering Costs

Where service is installed in a residence for range and hot water use following existing use of light there is something like $11 saving possible by use of service-entrance cable. This figure was cited at a recent meeting in Portland of the engineering division of the Northwest Electric Light and Power Association by S. B. Clark of the Northwest Electric Company. The detailed cost figures include converting to inverted sequence outdoor metering. The new main service switch is of the four-pole type, 60 amp. for range service and 30 amp. for water service. It automatically eliminates the hazard of not opening all main service switches which might occur when a separate switch is used for range and hot water. The arrangement costs less than two separate switches.



Existing lighting converted to outdoor metering on adding range and water heater

Cost of Adequate Service Installation for Range, Water Heater and Lighting Additions in Old Residence

A—Using Rigid Conduit

Item	No. Reqd.	Unit Cost	Extended Cost
Service			
1½-in. Conduit, ft.	15	$0.1829	$2.7435
1½-in. Conduit locknuts	2	0.0330	0.0660
1½-in. Conduit bushings	1	0.0545	0.0545
1½-in. LB Condulet	2	1.0290	2.0580
1½-in. Cond't blank covers	2	0.3136	0.6272
1½-in. Entrance condulet and cover	1	0.5860	0.5860
1½-in. Pipe straps	5	0.0135	0.0675
No. 4 R.C. stranded wire, ft.	15	0.03815	0.5775
No. 6 R.C. stranded wire, ft.	42	0.02985	1.2537
No. 8 R.C. stranded wire, ft.	20	0.01842	0.2964
Misc.—tape, solder, etc.	Job		0.5000
Material			$8.83
Labor			9.00
Range			
1-in. Conduit, ft.	15	$0.1352	$2.0280
1-in. Conduit locknuts	4	0.0215	0.0860
1-in. Conduit bushings	2	0.0415	0.0830
No. 6 R.C. stranded wire, ft.	50	0.02985	1.4925
Outlet box, 4 11/16x4 11/16x2½ in.	1	0.53600	0.5360
4 11/16-in. Outlet box cover, plain	1	0.21600	0.2160
Federal bushings No. 3A	1	0.06000	0.0600
1-in. Pipe straps	5	0.01030	0.0515
60A. 250-v. fused safety switch	1	(Price dependent on selection)	
Misc.—tape, solder, etc.	Job	1.00000	0.7500
Material			$5.30
Labor			3.00
Water Heater			
¾-in. Conduit, ft.	2	$0.0941	$0.1882
¾-in. Conduit locknuts	4	0.0130	0.0520
¾-in. Conduit bushings	2	0.0225	0.0450
½-in. Conduit, ft.	15	0.0757	1.1055
½-in. Conduit locknuts	4	0.00665	0.0266
½-in. Conduit bushings	2	0.01015	0.0230
4x4x1½-in. Outlet box	1	0.12000	0.1200
2/c No. 12 Bx., ft.	6	0.06000	0.3600
Connectors for 2/c No. 12 Bx	2	0.04400	0.0880
No. 12 R.C. wire, ft.	92	0.00754	0.6937
Blank cover for 4-in. box	1	0.04800	0.0480
30A. 2-p. 250-v. fused safety switch	1	(Price dependent on selection)	
Misc.—tape, solder, etc.	..		0.2500
Material			$3.00
Labor			2.50
Grounding			
½-in. Conduit, ft.	10	$0.07370	$0.7370
½-in. Conduit locknuts	2	0.00665	0.0133
½-in. Conduit bushings	1	0.01015	0.0102
½-in. Groundlet	1	0.60000	0.6000
Ground jumper—12-in.	1	0.2620	0.2620
No. 8 R.C. wire, ft.	12	0.01482	0.1778
Material			$1.80
Labor			1.00
Total material			$18.93
Total labor			15.50
Grand Total			**$34.43**

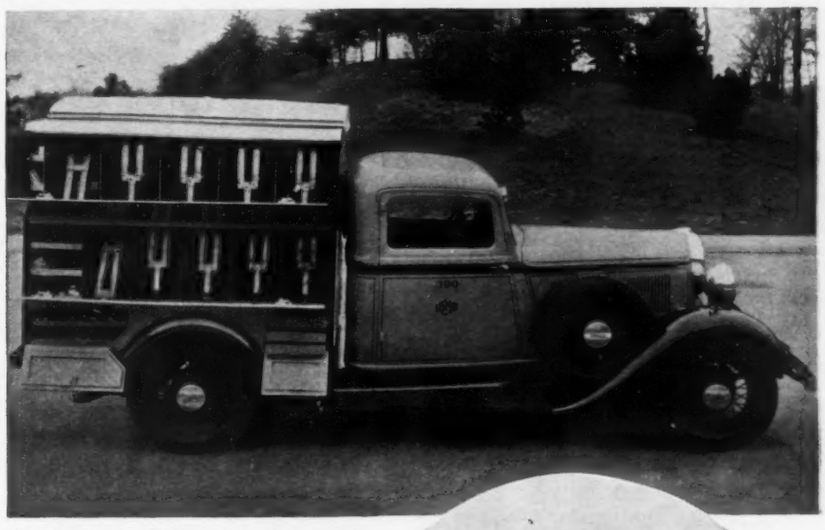
B—Using Service Entrance Cable

Item	No. Reqd.	Unit Cost	Extended Cost
Service			
Entrance cap. No. 5536	1	$0.4000	$.0.4000
5/c—Entrance cable (3/4-4-3/10), ft.	5	0.2320	1.1600
5/c—Entrance cable (3/4-4-3/10), ft.	14	0.1777	2.4878
Box connectors No. 3206	2	0.2192	0.4384
Box connectors for 1-in. Bx.	1	0.1500	0.1500
1½x2½-in. Conduit nipples	1	0.1200	0.1200
Cable straps	10	0.0272	0.2720
Misc.—tape, solder, etc.	Job		0.25
Material			$5.28
Labor			6.00
Range			
3/c No. 6 range cable (with gnd. wire), ft.	17	$0.1440	$2.4480
1 in. Conduit, ft.	1	0.1352	0.1352
1 in. Conduit bushings	2	0.0415	0.0830
Cable straps	10	0.0272	0.2720
60A. 250-v. safety switch	1	(Price dependent on selection)	
Misc.—tape, solder, etc.	Job		0.2500
Material			$3.19
Labor			2.00
Water Heater			
2/c No. 10 armored cable, ft.	23	$0.0880	$2.0240
Box connectors—¾-in. Bx.	2	0.1200	0.2400
Cable Straps No. 4177	10	0.0272	0.2720
30A 2-p. 250-v. safety switch	1	(Price dependent on selection)	
Material			$2.54
Labor			1.50
Grounding			
½-in. Conduit, ft.	10	$0.0737	$0.7370
½-in. Conduit locknuts	2	0.00665	0.0133
½-in. Conduit bushings	1	0.01015	0.0102
½-in. Groundlet	1	0.60000	0.6000
No. 8 R.C. Wire, ft.	12	0.01482	0.1778
Material			$1.80
Labor			1.00
Total material			$12.81
Total labor			10.50
Grand Total			**$23.31**

UNION GAS & ELECTRIC

Designs Unique New Meter Trucks

FOR LIGHTER, FASTER, LOWER COST OPERATION



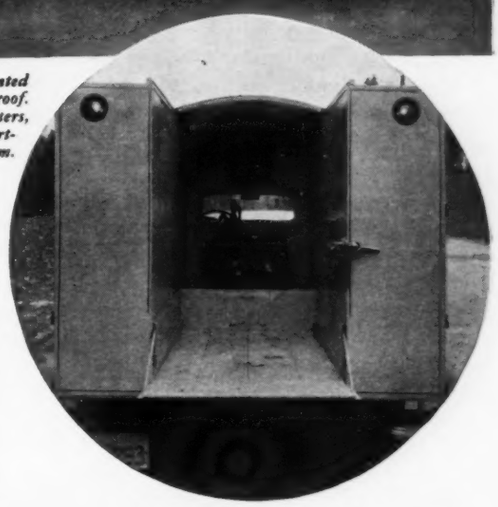
One of the new steel body meter trucks mounted on ½-ton chassis, showing the sliding roof, which moves forward to allow large tin meters, etc. to be loaded into truck. Side compartments are shown opened; also bins at bottom.

NEWEST EXAMPLES of an engineering ingenuity that has made the Union Gas and Electric Company, Cincinnati, famous for low cost fleet operation, are their new meter trucks. Company designed, they combine the ideas of Mr. Fred Heinlein, Superintendent of Motor Vehicles and those of the Gas Distribution Department.

The new trucks not only cost less than the old 1¼ ton open side delivery jobs, but are more economical to operate by approximately 42%, save time and carry considerably more equipment. In addition, license fees of $23.00 per year per truck are saved.

394 company owned units in the Union Gas & Electric fleet roll up an annual total mileage of over 4,000,000 miles. Strategic routing, highly specialized and efficient maintenance have been important factors in giving this fleet one of the lowest operating cost records in the utility field. Tailoring its own equipment to fit the job has also aided measurably.

"Our tires, also, are selected with careful attention to the type and size needed for every type of work," says Mr. Heinlein. General Truck Tires are used extensively in the fleet.



Rear view showing space for large equipment, with roof moved forward. Note end lockers for tools and equipment.

★

THE GENERAL SPECIAL COMMERCIAL is used by many utilities on a majority of their trucks, This is only one of the complete line of Generals . . . each designed and built specifically to do a certain job better.

★

3 REASONS WHY GENERALS ARE MORE PROFITABLE TO YOU:

1. Generals are stronger tires—additional full-width plies of powerful cord are anchored bead to bead—with no "idle" plies—no floating breaker-strips.
2. Generals are cooler tires—they flex uniformly without that heat-producing "hinging action" of ordinary breaker-strip tires.
3. Generals have "compact rubber" treads—their construction keeps the tread rubber compact and compressed so that it wears slowly and gives more miles.

•

• FREE • this valuable booklet on how to get more service from your truck tires. Write to The General Tire & Rubber Co., Akron, Ohio.

GENERAL TRUCK TIRES

Electric Defrosting of Brine Pipes

A portable combination of an electrical heat generator with pumping and control equipment has become a simple, efficient and practical defrosting device for removing snow and ice from brine coils in cold storage rooms.

No longer is it necessary for men to climb upon ladders or scaffolds and with heavy hammers undertake to knock the accumulation of frost off the pipes. In addition to this direct saving in labor, there is also a saving due to the reduction and elimination of leaks, formerly caused by the heavy and lengthy hammering of the pipes. Equally important is the thorough inside cleaning of pipes which this portable defroster is reported to guarantee.

Complete inside and outside pipe-and-coil cleaning results in lower operating costs for commercial refrigerating systems. Use of this electrically heated defroster in cold-storage warehouses is reported to pay for itself in less than a year. Three men can remove a heavy accumulation of frost from 500 ft. of 2-in. brine pipe in twenty minutes. This is 25 per cent faster than the "hammer-and-hand" method.

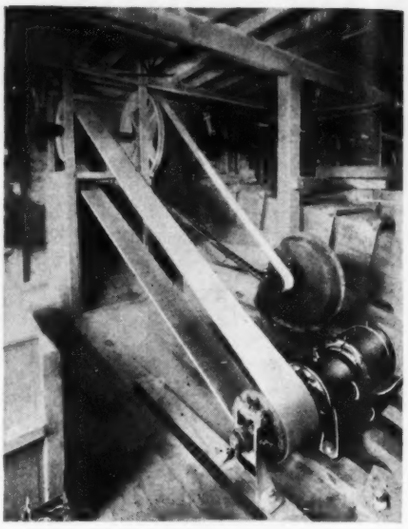
Electric defroster removes ice from brine

•

Simplifying a Group Drive

In modernizing the Gloucester (Mass.) factory of the Russia Cement Company, producer of Le Page's glue and other adhesives, it was found economical to retain a considerable part of the group drives previously run by steam engine power. A typical case of efficient speed reduction in a sectionalized area, with simplification of the belt and shafting arrangements, is shown in the accompanying view in the drier department, obtained through the courtesy of Alonzo B. Reed, engineer, Boston, Mass., the company's consultant.

Formerly the line shaft at the rear was driven from the floor below by a quarter-turn belt run from still another shaft. It drives a slow-speed rotary kiln drier (not shown) and also an exhaust fan shown at the right center. The shaft speed is 164 r.p.m. and the exhauster runs at 1,220 r.p.m. It was desirable to use an 1,800-r.p.m. motor to drive this section, on account of the lower price of the unit compared with slower speed equipment, so a 15-hp., 440-volt, three-phase, Louis Allis induction motor with an Allen Bradley starter was provided. A Falk reduction gear mounted at the left of the motor reduced the speed to 380 r.p.m., and the shaft is driven by a 10-in. canvas belt connecting a 13-in. pulley with outboard ball bearing with a 30-in. pulley on the main shaft.



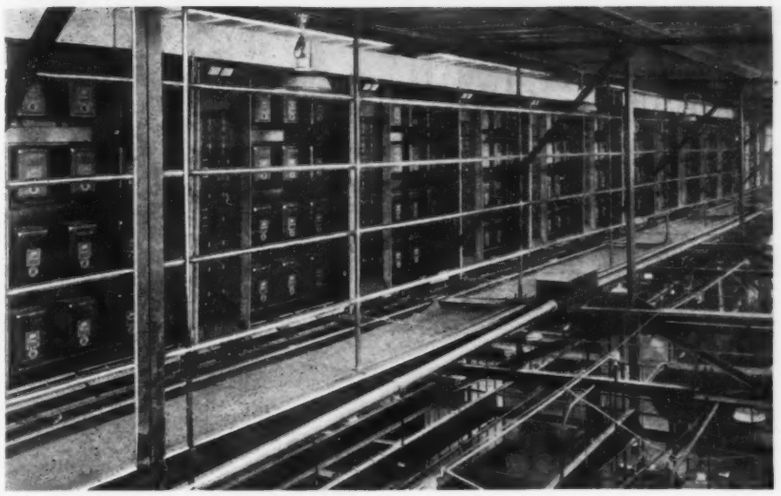
Compact drive cuts speed from 1,800 to 164 r.p.m.

The arrangement reduces friction losses and does away with a complicated system of countershafting which would have been required unless a more costly motor of extremely slow speed had been used to accomplish the purpose.

•

Control Placed for Convenience

Where can electrical control apparatus for factory machines be situated so it meets all the following requirements? (1) Short connections between it and processes controlled; (2) ability to centralize control yet have individual remote control at individual processes; (3) controlled processes within view of centralized control;



Centralized yet readily accessible control above machine floor

(4) occupy unproductive space; (5) readily accessible for inspection and maintenance; (6) nearness to load center to permit maximum use of feeder investment; (7) ease of making changes or extensions.

Here is the way one industrial did it. The starters for all the machines in this department are grouped on panels on a catwalk over the working floor. They are separated at intervals by panels containing compact cut-outs for each circuit. Circuits to and from the starters are in ducts that can be easily opened for inspection or changes. Each starter has its individual start-stop button and remote control is placed at the machines.

•

Identifying Circuits in Factories

By K. B. HUMPHREY
Waterloo, Wis.

In an industrial plant with a large number of scattered electric motors it should be obvious that the individual switches and feeders should be plainly marked as to what they control. But unfortunately the obvious is often overlooked. Labeling will save time and unnecessary hunting and testing when there is trouble. Some sort of planned identification is necessary in a plant that operates 24 hours a day with possibly only one or two men on duty at night. Even when the organization is large enough to have an electrician on duty at all times labeling the circuits will help in locating trouble.

Each motor or group of motors is supplied by a circuit which has a switch near the main feeder fused according to the horsepower of the motor, or motors, supplied. This switch should be labeled on the outside with the name of the machine and its number or some name such as "fan" or "house pump." Usually the machines around the plant are named by the men working with them, and it is better to use their terminology rather than technical names. If the switch is on a feeder which supplies a large group of motors, or possibly a whole separate building, it should be labeled so as to distinguish it from a switch supplying only one machine.

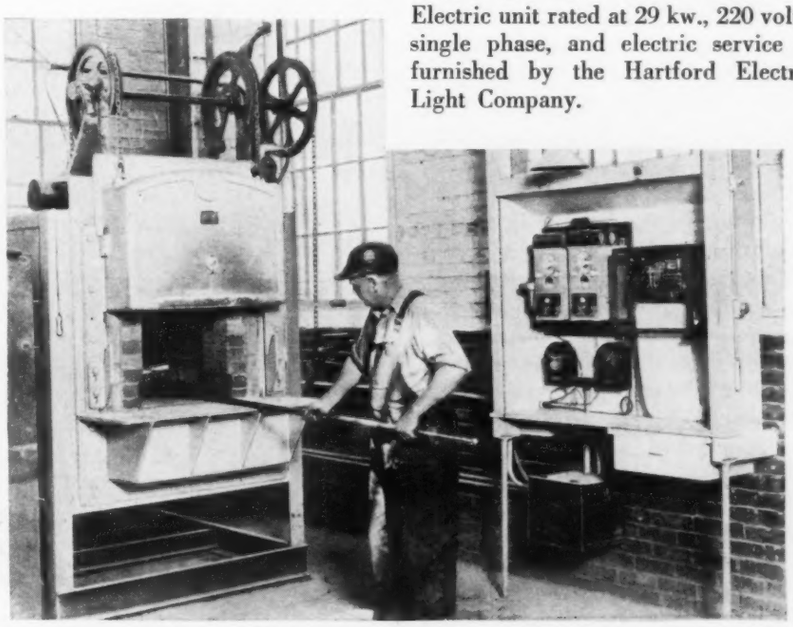
Inside the cover of the ordinary safety switch there should be plainly marked the size of the fuse in amperes for the circuit. If this is not done it will be found that after a year's operation the circuits will invariably be overfused, thus giving very little real protection. On the inside cover of a group feeder switch it is a good plan to list the entire number of motors according to what they drive. It is seldom that trouble occurs at this point, but it is often essential to know whether "killing" the circuit will stop some machine which should not be stopped unless it is absolutely necessary.

•

Furnaces Carburize Economically

In manfacturing overseam sewing machines the Merrow Machine Company, Hartford, Conn., has been carburizing many of the thousand parts electrically for more than five years. Accuracy of heat control, cleanliness and convenience of the initial equipment led to a second electric-oven installation of similar type. When it is feasible to charge the oven from the cold state during the night hours, this is done with the advantage of a 40 per cent power discount on energy cost after 10 p.m. The carburizing time ranges from three to twelve hours, according to the character and size of the pieces treated. Ordinarily carburizing is done at temperatures exceeding 1,450 deg. F. The ovens are also used for annealing in the 1,000-1,300-deg. range.

The automatic temperature control, time switches controlling the off-peak service and temperature and recording instrument are located close to the newer oven. The oven is a General Electric unit rated at 29 kw., 220 volts, single phase, and electric service is furnished by the Hartford Electric Light Company.



Sewing machine parts electrically carburized

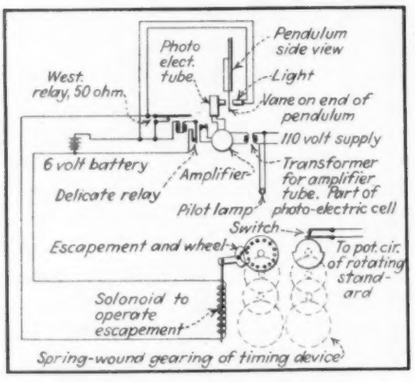
NEW ENGINEERING IDEAS

THEORY • DESIGN • MANUFACTURE • CONSTRUCTION • UTILIZATION

Photo-cell Timer for Meter Tests

By JOSEPH LANG
Meter Department,
Public Service Company of Colorado,
Denver, Colo.

Since photo-electric relays have become commercially available, the one-time familiar mercury contact that had to be so carefully adjusted and maintained in the pendulum swing in the standard clock has almost entirely disappeared from electric meter laboratories. The timing device used for checking rotating standards in our meter laboratory is, for its kind, an extremely simple mechanism. It embodies no exactly calculated gear ratios, has only one actuating spring to be kept wound and has never been found in an error of more than 0.11 per cent.



Scheme of photo-cell timer

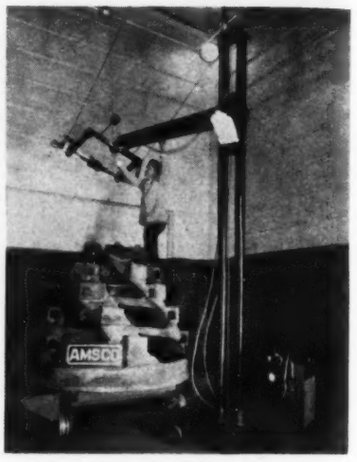
A vane on the pendulum of the clock, which is regulated daily on time signals from Arlington, interrupts the light beam falling on the photo-cell. The resulting impulses from the cell are amplified and relayed to a solenoid escapement on the timing mechanism. One end of the actuating spring in the mechanism drives the escapement wheel, controlled in its rotation by the solenoid. This wheel has 24 pins and thus makes one revolution in 24 seconds. Geared to the escapement wheel in a two-to-one ratio is a cam wheel that once in each revolution (once every 48 seconds) releases and allows a wheel driven by the other end of the actuating spring to make one-half turn. On the shaft with this wheel is a 180-deg. cam which operates a contact in the potential circuits of the rotating standards being tested. Thus, while the timing device is in operation, the instruments under test are alternately on for 48 seconds, then off for the same time.

•

X-Ray a Foundry Production Tool

One of the most efficient and powerful X-ray equipments in the foundry industry has recently been put into service by the American Manganese Steel Company. Experience so far indicates that previously used testing methods were more expensive and less certain in their indication. It is neither necessary nor desirable to X-ray all castings made. Pilot castings of a given lot are examined, and many large or expensive parts, as a matter of standard routine.

With the X-ray the experienced radiographer can "see into" the cast to a depth of 5 in. and make sure that all defects within the area photographed, whether shrinks, spongy metal, blowholes, internal cracks or inclusions, will show up clearly. The basic function of the X-ray is to present to the engineer or foundryman his problem in unmistakable visual terms, and then with this inside information he can by a change of methods or by a series of changes checked by X-ray inspection of the experimental castings reach a designed solution.



Foundry "looks into" castings with X-ray

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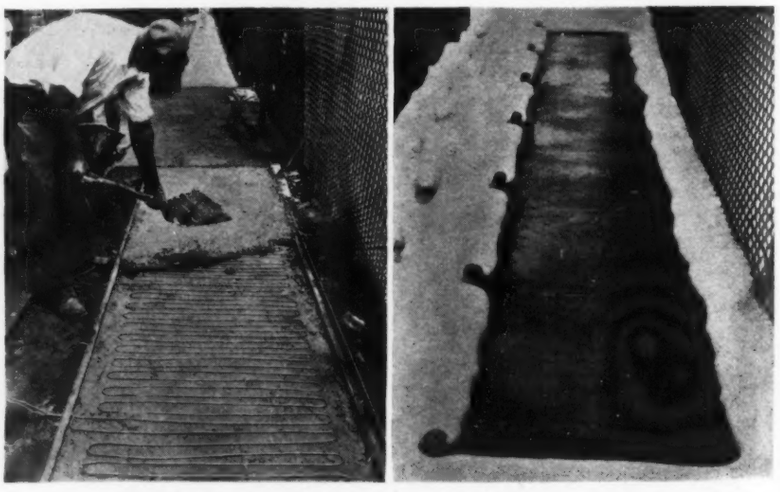
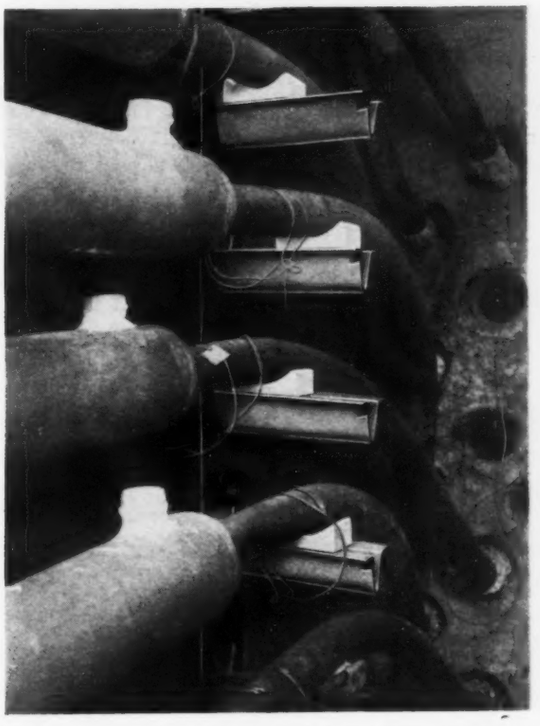
Melts Snow and Prevents Freezing

Heating elements imbedded just below the surface of this experimental walk at the plant of the Rockbestos Products Corporation, New Haven,



Heating elements imbedded in sidewalk keep it cleared of snow and ice

Cable Racks
for Manhole, Vault, Station Wall and Service Box Mounting



Manhole installation showing Heavy Duty Murray Cable Rack and Oil Filled Cable Joint. Write for price sheet and booklet on Murray Cable Racks—illustrating the types of racks manufactured.

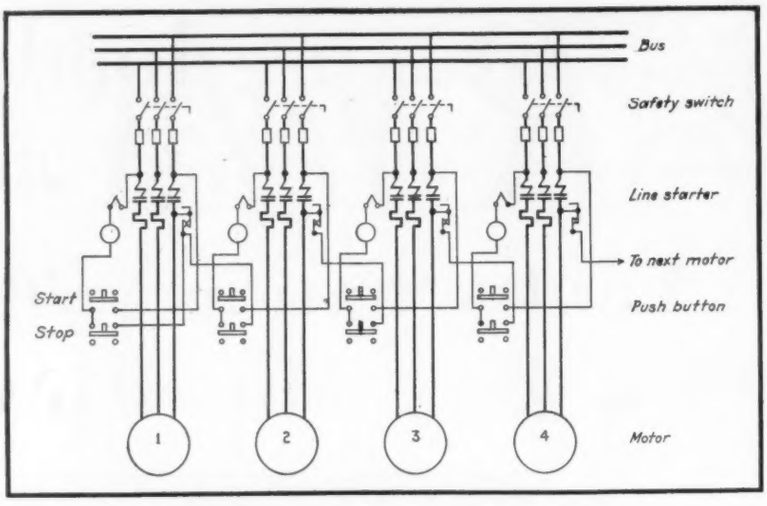
A 30-year-old guarantee of quality

Illustrations show types of Murray Cable Racks — with and without porcelain insulators — light duty and heavy duty. Write for price sheet and illustrated 12-page booklet, "Cable Racks, Fair Leaders, and Manhole Wall Inserts."

The name MURRAY is backed by a long and widely known reputation for quality and service. Attached to any electrical distribution device, it is assurance of excellence in design, materials and manufacture. It reflects the wide scope of Murray experience in supplying a great variety of the service needs of the industry since 1902.

METROPOLITAN DEVICE CORP.
1250 ATLANTIC AVENUE, BROOKLYN, N. Y.

MURRAY DISTRIBUTION DEVICES



Piling up prevented by conveyor interlocking

Conn., melt snow and prevent ice formation at temperatures as low as 15 deg. F., with a power consumption of 40 watts per square foot, it is reported. Asbestos-insulated, lead-sheath industrial heating cable was laid in parallel loops 1 in. below the surface of the concrete walk so that a heat output up to 40 watts per square foot could be produced. With this input it was calculated that the temperature of the walk could be maintained at 35 deg. F. with an outdoor temperature of 15 deg. F.

Experience with the prevention of ice accumulation on hydro-plant trash racks indicated that the racks need be kept only a small fraction of a degree above freezing to be effective. Consequently this installation might be effective in preventing snow accumulation or ice formation with outdoor temperatures approaching 10 deg. F.

•

Conveyor Motors Sequence Interlocked

By A. P. SCHNYDER
Electrical Engineer
with George F. Hardy, Consulting Engineer,
New York, N. Y.

Chip conveyor belts in a paper mill are usually designed to afford a continuous band from the chipper in the wood room to the digestor chip bin. Some means has to be found to assure proper sequence of the motors driving the successive series of conveyors, otherwise the chips will pile up somewhere in case of failure of any link.

In regular operation the connections shown necessitate that the last conveyor be started first, succeeded by the next in line, and thus back to the woodroom chipper. Upon dropping out of any motor starter all starters behind this one drop out successively and the piling up is averted. Any motor can, of course, be started independently of the others by holding its start button pressed down.

•

Recirculated Water Scrubs Flue Gas

Purification of flue gases in urban districts can now be accomplished without any discharge of effluent into rivers and streams. The new process, which has been installed in the Howden-I.C.I. system, Billingham, England, involves the recirculation of water used for scrubbing the gases, the fixation of acids by treatment with alkali, such as lime or chalk, and the removal of solid matter, by settling and filtration.

Plant equipment comprises (1) lime and chalk storage, mixing apparatus and storage tanks, (2) absorption and liquor recirculating systems, (3) settlers and filters, and (4) arrangements for returning clarified liquor to the recirculating system. The only materials entering the plant, apart from the flue gases, are lime and such little water as may be necessary to make up for losses through evaporation or the discard of wet solids.

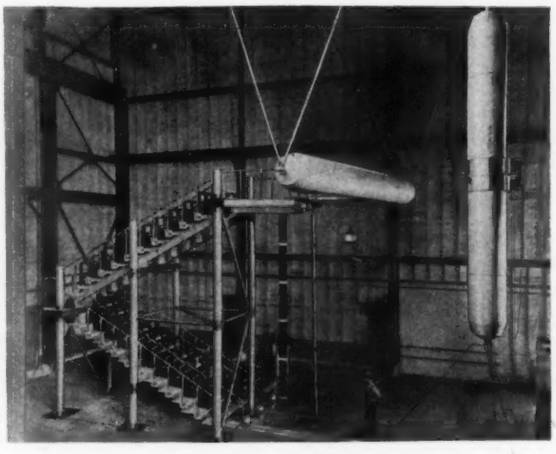
The initial outlay for completely cleaning of the flue gases was estimated to be about $6 per kilowatt, while the operating costs for such a system were claimed as $0.03 per kilowatt-hour.

•

Capacity Divider Has Novel Design

In the new high-voltage testing laboratory of the Allis-Chalmers Manufacturing Company at Milwaukee a distinctive design of capacity type voltage divider has been applied to step down the impulse voltage applied to the cathode-ray oscillograph.

The capacitance divider consists of two large metal cylinders 30 in. in diameter and 25 ft. long, placed in space at right angles to each other, one being vertical and the other horizontal. The horizontal cylinder is connected to the high-voltage terminal of the impulse generator and forms part of the discharge circuit. The vertical cylinder, which is grounded, has two metal bands in the center, one of which is insulated from the cylinder by space sticks. This band will pick up a voltage that is proportional to the terminal voltage due to its capacitance coupling with the horizontal cylinder. The plates of the cathode-ray oscillograph are connected to these bands through a two-conductor cable with grounded sheath. In this way the deflection plates of the oscillograph are subjected to a voltage that is proportional to the high-voltage at the high-voltage terminal. The capacitance divider is calibrated against a conventional resistance-cable divider.



Metal cylinders used for capacity divider

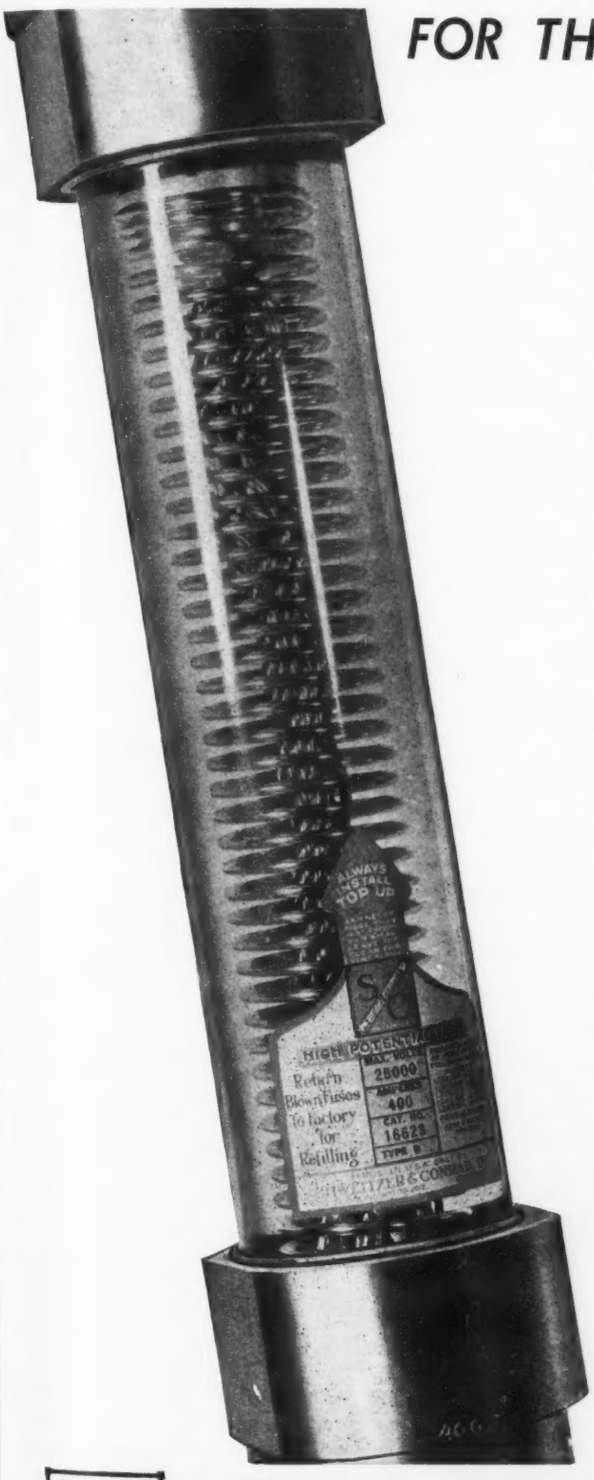
Electrostatic lines of force converge on the center of the vertical cylinder producing a uniform field.

Protect that increasing load–

RETURN BLOWN OR OLD TYPE UNBLOWN FUSES

FOR THE . . Latest improved

S & C FUSES



YOU can now get *better protection* than ever before—those increasing loads, greater revenues from ranges and appliances can be protected at low cost by installing new S & C Fuses. . . . The advantages are—

- **LOW COST through our REGULAR REFILL EXCHANGE POLICY.**
- **HIGHER INTERRUPTING CAPACITY THAN STANDARD CATALOGUE VALUES NOW AVAILABLE AT STANDARD REFILL PRICES.**
- **Accurate long life TIME-CURRENT CHARACTERISTICS particularly designed to obtain selective operation with associated circuit interrupting devices. Freedom from transient and momentary overload blowing.**
- **POSITIVE CIRCUIT INTERRUPTION AT ALL FAULT CURRENTS.**
- **Long life high dielectric liquid maintains original efficiency and thus adequately GUARDS YOUR SERVICE for years.**
- **The improved construction and the improved liquid prevents leaks.**
- **IMPROVED VOLTAGE STRESS AVAILABLE IN NEW DESIGNS FOR 132,000 VOLTS.**
- **AVAILABLE IN DESIGNS FOR CUBICLE AND ALL INDOOR APPLICATIONS, — THE TYPE C.**
- **AVAILABLE IN TOTALLY ENCLOSED AUTOMATICALLY RECLOSING EQUIPMENT, — THE LOADGARD.**

Check up your requirements—and send us list of your blown or old type unblown fuses for exchange.

"Experience will choose the S & C Fuse"

REG. U. S. PAT. OFF.

SCHWEITZER & CONRAD, Inc.

4435 Ravenswood Avenue, Chicago, Illinois

Air Conditioning Extended in East

Air conditioning is gaining increased acceptance industrially and commercially throughout the country. Several instances of it, in Pennsylvania, New Jersey and New York, were cited at a recent meeting of the Interstate Power Club (Max Cole, Philadelphia Electric Company, chairman). Among industries and businesses reported to have adopted it recently, or to be planning to do so shortly, are cigar factories, silk and rayon mills, restaurants, chain stores (including 5 and 10), drug and candy, women's apparel shops and funeral parlors.

Progressive manufacturing policies and business competition were said to be largely responsible for the increasing acceptance of air conditioning. Among advantages cited for it are controlled atmospheric conditions permitting processes heretofore confined to certain climates, reduction of rejects, increased employee efficiency, lower turnover and less sickness, increased patronage and, in the case of restaurants, increased summer appetites. Evidence was presented that air conditioning can usually be economically justified even at present prices.

The sales job

Advantages of air conditioning are sufficiently well accepted by a wide enough variety of industrial and commercial organizations so that extension of usage will depend chiefly on the coordinated selling efforts of utilities and manufacturers. Economic data based on experience of existing users are valuable and are being compiled for selling ammunition, but are not necessarily the most important factor in selling now. Nothing prompts a prospect to adopt air conditioning so much as the fact that a competitor is diverting patronage from him. Consequently, it is important to induce key industries and commercial organizations in each territory to adopt air conditioning. Competition will induce the remainder to fall in line.

To stimulate interest among prospects, probably different sales organization set-ups will have to be used in sparsely settled and congested territories. Philadelphia Electric finds that carefully prepared circular mail distributed to prospects and timed so that it can be followed up promptly by personal salesmanship is very effective. This method is employed on all prospects for 25 hp. or more, commercial and industrial. The mailing pieces are developed so that there is large personal appeal, even though numerous prospects are approached in this way. As many as 60 per cent of the responses to these circular-mail appeals show sufficient interest to be turned over to manufacturers of the equipment directly, it is reported. After a prospect is brought up to the necessary degree of interest, manufacturers' representatives are called into the case to make estimates of equipment needed, and initial and operating costs. Even in sparsely settled territories it appears that a similar method can be used if, as is done in Philadelphia, circular mail is used throughout the year on different applications to stimulate interest, and the distribution is timed so salesmen can call and capitalize on the interest created.

Experience from remote places does not appeal so much to prospects as that from users in the same territory. Competition is the mainspring that urges them into action.

Feeling Out the Ironer Market

FREE TRIAL OFFER IS BIG HIT
Special Campaign Offers Opportunity to Try Any Make Electric Ironer in Your Home for 10 Days
Big Electric Ironer Free Trial Offer Appeals to Hundreds of Local Women
OPPORTUNITY TO TEST ANY ELECTRIC IRONER IN YOUR OWN HOME FOR 10 DAYS
Still Time To Take Advantage of Free Electric Ironer 10-Day Trial Offer
Offer Expires
HURRY! HURRY! LAST CALL FOR THIS EXCEPTIONAL
GREAT NEWS FOR HOUSEWIVES!
SIT DOWN WHILE YOU IRON
Doesn't Cost You a Red Cent to Get This Special Free Home Demonstration
Delivered and Called for Free
All Popular Makes To Choose From
SOUTHERN CALIFORNIA EDISON COMPANY, LTD.

Type of advertising used in Pomona ironing machine campaign

Prospective purchasers for electric ironing machines in the Pomona city territory of the Southern California Edison Company were brought to light in large numbers in a recent co-operative advertising campaign instituted by the company. In the first three weeks of a four-week campaign approximately 100 bona fide prospects were listed by the firms representing six makes of ironers participating in the campaign. Eighteen actual sales had been made, according to the preliminary report.

Edison company advertising was used as the dominating feature of four full pages carrying advertising of each of the electrical dealers who participated. During the full time of the campaign use of the Edison company division office display floor was available for the dealers to display their respective makes of ironers. Display dates were rotated. Dealers also had showings and demonstrations on their own sales floors. The beneficial results of the campaign in Pomona have prompted the Edison company and ironer distributors to plan similar campaigns in other sections.

Surge Proof Transformers for *Three Phase Distribution*

Type TSB and Type TCB

Allis-Chalmers now offers 3-phase Surge Proof distribution transformers in which are incorporated all of the advantageous features inherent in the equivalent single-phase Type SB and CB units. They are available in all NEMA ratings. They are better than conventional transformers . . .

BECAUSE

1- They are inherently surge proof.

2- They are provided with coordinated, cover mounted, high voltage bushings.

3- A gang-type low voltage bushing is installed in the front of the tank.

4- All bushings are of high grade, wet process porcelain provided with sturdy solderless connectors.

5- Oil sampling and drain valve is located at the side of the case, convenient to the lineman.

6- They cost no more than equivalent in three single-phase units and can be installed at less expense.

7- Transformer is completely oil tight and is shipped filled with oil ready for service.

8- An improved painting process greatly improves the protection of the tank against deterioration under weather conditions.

ALLIS-CHALMERS

— Allis-Chalmers Manufacturing Company, Milwaukee, Wisconsin, U.S.A. —

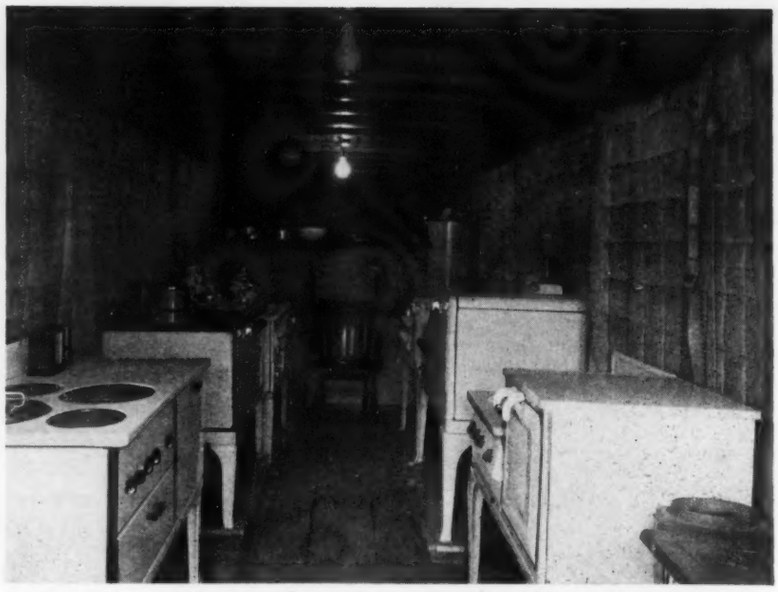
Amherst Homes Gain 55 Kw.-Hr. per month

Domestic consumption of electricity has increased from 69.5 kw.-hr. per month to 115.4 kw.-hr. per home customer in the college town of Amherst, Mass. This is largely the result of the Western Massachusetts Electric Company's program exchanging an electric range free for every gas stove removed in connection with the abandonment of gas service in that community. The changeover was completed and the distribution of gas stopped on November 15, 1934.

Amherst is a college town with practically no industry. The gas company served about 1,000 local customers, 860 of these domestic. On January 1, 1934, there were about 175 electric range installations within the gas area. During 1933 the range oil burner had made substantial inroads and the company could see no way of increasing the gas business to a point where prices could be reduced. It was therefore decided to abandon the gas company (which was under the same management) and convert as many customers as possible to electric service.

On May 1, 1934, there were 813 gas ranges on the pipe lines. Harry E. Duren, vice-president and general manager, estimated that they could probably hold 700 of these customers for electric cooking.

The surprising result was a total of 872 electric ranges installed, of which 839 were domestic—26 more than the total number of gas ranges! There were eighteen domestic type ranges installed in commercial establishments and fifteen heavy-duty commercial ranges. The above eighteen were mostly six-unit, double-oven ranges for boarding and fraternity houses. This increase in domestic ranges was due to the fact that there were a number of customers having gas hot water heaters, gas mangles or other gas equipment which they traded in toward electric ranges. More than 60 per cent of the customers elected to install better equipment than the free exchange models, paying the difference in price themselves. Only nine cooking equipments were lost to other types of fuel. During the changeover local dealers sold twelve ranges at regular prices outside the gas area. In the year 1934 884 electric ranges were installed in the town. Prior to May 1, 199 ranges were in service in Amherst, making a total on January 1, 1935, of 1,083 ranges. The population is about 6,000. There are 1,573 domestic customers, giving a saturation of 66.75 per cent.



Truck holding electric ranges, which visited residential neighborhoods at start of program to show public free exchange units

Besides the ranges 93 side-arm and four storage type electric water heaters were installed in the homes. In the commercial establishments several bakeovens, roasting ovens, fry kettles and counter equipment have been installed for lunch wagons and restaurants. A number of storage type water heaters also went into barber shops and beauty parlors.

In the exchange arrangement a three-unit standard oven range was provided for the small bungalow type of gas range and a standard four-unit table top outfit was given for larger installations. The peak demand on the Amherst substation has increased by about 500 kw., but if allowance be made for the demand caused by the heavy-duty commercial equipment, it appears that the demand per range is under 500 watts at the substation. The average capacity of the installed ranges was about 10 kw.

At this time it is not feasible to give any revenue figures, as there have been some rate changes in Amherst during the past few months, including a change from the area system of rates to a straight block system. However, the table below shows the increase in energy consumption at the substation.

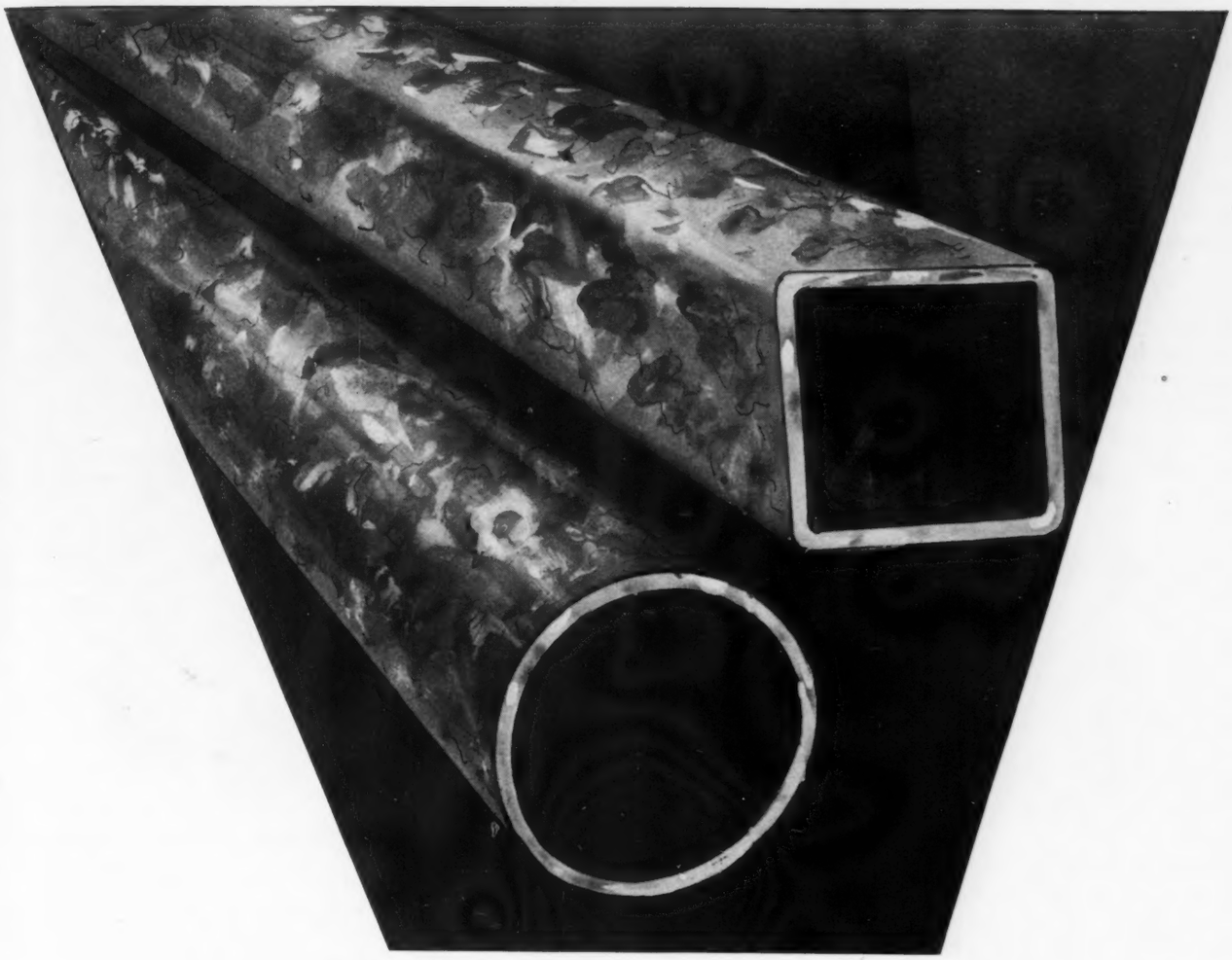
	—Kw.-Hr. at Bus—		
	Domestic	Commercial	Total
1934	363,986	196,572	560,558
1933	219,246	103,679	322,925
Increase	144,740	92,893	237,633
Per cent	66	89.6	73.5

Domestic kw.-hr. per month per customer increased from 69.5 to 115.4.

Sales Dep't Rigs Up Milk Cooler Exhibit

Taking the electric milk cooler direct to the farm is one of the latest plans of the Central Maine Power Company salesmen to boost the kilowatt-hour use on farms in its territory. A small truck fitted with complete milk-cooling equipment provides a complete and handy demonstration to farm prospects right in their own dooryard. A small "chest" refrigerator and electric water pump are also included in the exhibit.

The plan has been tried in each of the company's four divisions with equal success in each territory. Not only have some valuable leads been secured but actual sales of the appliances shown have been made on the spot, with sales of other appliances also being made. In some cases the "demonstration" has been scheduled ahead with a number of farmers grouping together for a larger demonstration. With the coming of winter traveling it was necessary to discontinue the exhibit, but the company plans to start its tour again this spring.



THIS IS MICA TUBING

Made to accurate dimensions. Any size, shape or quantity. Great tensile and electrical strength. Made in five compositions—

All Mica—for high potential work, sleeves, brush steel holders, grid rheostat rods, etc.

98% Mica—outside paper covering which prevents possible scaling.

85% Mica—combination of Mica and paper.

50% Mica—50% compressed sheet Mica and 50% paper.

Asbestos and Mica—40% compressed sheet Mica and 60% asbestos. Used for apparatus subject to moderate heat, such as rheostats, resistance boxes, etc.

Macallen Mica in sheets and parts uniform in quality and dependability.

Mica is not a substitute—there is no substitute for Mica as an insulating material unaffected by heat, moisture and oil.

The MACALLEN CO

16 MACALLEN ST, BOSTON.

CHICAGO 565 W WASHINGTON BLVD. CLEVELAND 902 LEADER BLDG.

MEN OF THE INDUSTRY

F. A. Young of Rhode Island Heads New Regulatory Body

Frederick A. Young, president of the Power Service Corporation, engineers and architects, Providence, R. I., has been appointed chief of the Division of Public Utilities of Rhode Island, which has been formed to supersede the state Public

F. A. Young

Service Commission. Mr. Young has been active for the past twenty years in the public utility power plant engineering field. He was born in New York City 42 years ago and was educated at the Heffley Institute and Pratt Institute of Science and Technology at Brooklyn. He was instructor in the New York Edison school of engineering and organized the first school for operators for the New York & Queens system. He has been a consultant on power plant design and service problems for many private and public enterprises in the East and central West.

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▶ BERNARD P. SHEARON of Fort Wayne, Ind., has been re-elected secretary and controller of the Indiana Service Corporation and also named a vice-president.

▶ WILLIAM H. HODGE, vice-president of the Byllesby Engineering & Management Corporation, Chicago, and manager of the sales and advertising department, recently completed 25 years of service with the Byllesby interests. Byllesby officers and executives joined with a number of friends of Mr. Hodge from other business organizations in sending congratulatory messages and celebrating the occasion.

▶ J. K. KNIGHTON has been appointed manager of the air-conditioning sales department of Kelvinator Corporation. Well known in the electric refrigeration industry through a number of years of special field work, Mr. Knighton is equally familiar with the air-conditioning industry, where his work has brought him in close contact with air-conditioning dealers and their merchandising problems.

▶ FLOYD L. CARLISLE and GEORGE H. HOWARD have resigned as directors of the United Gas Improvement Company. The by-laws of the company were accordingly amended reducing the number of directors from sixteen to fourteen.

▶ LEONARD W. HORR, formerly Chicago manager of the Henry Vogt Machine Company, Louisville, Ky., has become associated with the cooling equipment division of the Binks Manufacturing Company, Chicago.

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E. H. Will Appointed Superintendent in El Paso

E. H. Will, formerly connected with the Virginia Electric & Power Company, Richmond, has been transferred to El Paso, Tex., as general superintendent of light and power of the El Paso Electric Company. Both properties are under Stone & Webster management. Mr. Will is a native of Richmond. His first position, following graduation from the Virginia Polytechnic Institute, was in the engineering department of the Virginia Railway & Power Company in 1922.

After the Virginia Electric & Power Company assumed control of the property Mr. Will continued in the organization. From Richmond he was transferred

E. H. Will

to Norfolk and placed in charge of the engineering department. Subsequently he became assistant to Vice-President T. P. Walker. In 1928 he was made manager of the Suffolk district, where he remained for almost four years. He then returned to larger responsibilities in Richmond.

Moreland to Head M.I.T. Electrical Department

Edward L. Moreland has been appointed head of the department of electrical engineering at the Massachusetts Institute of Technology, to succeed Dr. D. C. Jackson, whose retirement, set for next June, was announced in the

E. L. Moreland

ELECTRICAL WORLD March 30, page 130. Mr. Moreland is senior partner in the engineering firm of Jackson & Moreland, Boston, and is widely known in the public utility field and engineering profession. Following graduation from M.I.T. in 1908 he entered the firm of D. C. & Wm. B. Jackson at Boston, which became the firm of Jackson & Moreland in 1919, from which Professor Jackson retired in 1930. Mr. Moreland has been identified with many important engineering projects, including the electrification of the Great Northern Railway through the Cascades, the electrification of the New York suburban system of the Lackawanna Railroad and numerous engineering investigations for the Boston and New York Edison companies, Philadelphia Electric Company and New England Power Association. The firm has also done much work for public utility commissions and other public bodies, including a study of the electrical characteristics of transmission lines and generating equipment for the T.V.A.

In the industrial field Mr. Moreland has had wide experience in both steam and electric power plants. He spent about two years in England about 1911 to aid the British Government in transferring the National Telephone Company to the jurisdiction of the Post Office Department. He is a fellow of the A.I.E.E.

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▶ CLARENCE L. LAW, general commercial manager of the New York Edison Company and the United Electric Light &

Power Company, has been appointed executive assistant, reporting to President Frank W. Smith and Executive Vice-President Robert B. Grove. This closer association with the leading executives of the New York and United companies follows 28 years of service in the New York Edison Company.

▶ HOWLAND H. PELL, Jr., has been elected secretary of the Columbia Gas & Electric Corporation. JOHN G. PEW has been added to the executive committee.

▶ FRANK J. TONE, president of the Carborundum Company, Niagara Falls, N. Y., was awarded the Acheson Medal and $1,000 prize for 1935, in conjunction with the recent meeting of the Electrochemical Society at New Orleans, for his outstanding accomplishments in electrothermics. Presentation of the medal and prize will take place next October at Washington, D. C., where the society will hold its fall convention.

▶ PROF. HAROLD L. HAZEN of the Massachusetts Institute of Technology has been awarded the Levy gold medal of the Franklin Institute, Philadelphia, for outstanding papers on the theory and design of servo-mechanisms. Presentation will be made at Philadelphia May 15. Professor Hazen is exchange professor this year from Ohio State University, in the department of electrical engineering.

▶ ALBERT C. LEHMAN, president of the Blaw-Knox Company, was elected to the recently created position of chairman of the board, at a recent meeting of the directors, in appreciation of his thirty years of service to the company since its inception. IRVIN F. LEHMAN, vice-president, who has also been associated with the company since its early days, was elected president and FRANK CORDES was made senior vice-president.

▶ JULIUS J. TOROK, for the past ten years identified with the Westinghouse Electric & Manufacturing Company, has entered the research and development department of the Corning Glass Works, Corning, N. Y. He will devote his time particularly to "Pyrex" insulators and allied products. Immediately following graduation from Pennsylvania State College he joined Westinghouse, engaging in intensive training comprising special courses in design and application. In 1926 he was transferred to the high-voltage laboratory at Trafford, Pa., in charge of impulse testing. His investigations and experiments led to the use of new methods of surge testing and early in 1929 he developed a new type of lightning arrester which operated on a radically new principle. In that year he was placed on the staff of C. L. Fortescue, consulting engineer, in charge of the numerous lightning investigation field stations. In 1933, when these stations were closed, he was transferred to the

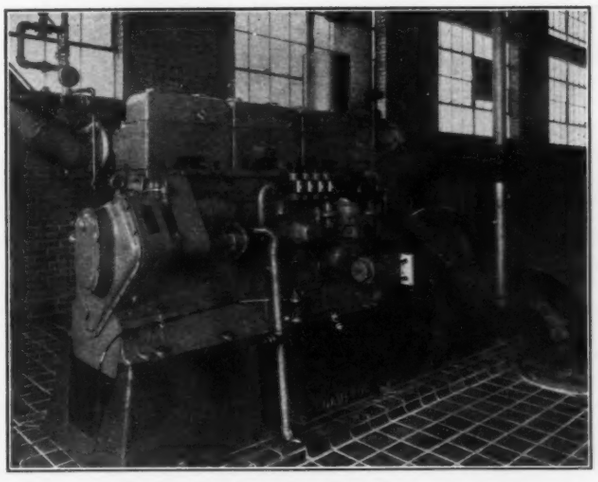
THE LAST RESORT

when electric power fails is the Sterling gasoline engine. For having established these engines for standby and emergency duty, for continuing, alone, to build 1200 r.p.m. engines, there has been attained continued success of all the sizes and, finally, the largest bore high speed engine of this type in the world.

The Viking model 8 cylinder

Sterling High Duty Internal Combustion Engine

12 to 565 B.H.P.
Gas or gasoline



At the Steel Co. of Canada, Hamilton, Ont., 2 Viking II, 6 cyl., 425 H.P. Sterling engines running 1200 R.P.M. direct connected to a Cameron centrifugal pump as a standby unit.

STERLING ENGINE COMPANY

1270 Niagara St.
Buffalo, N. Y.

Dept. C-2

900 Chrysler Bldg.
New York, N. Y.

transformer engineering department in charge of special problems, and one year later to the circuit breaker division in charge of lightning arrester development, where he developed a new high-capacity lightning arrester. He has read papers on various occasions before the American Institute of Electrical Engineers and has contributed frequently to the technical press.

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Elihu Thomson Honored by German Engineers

Prof. Elihu Thomson, consulting engineer of the General Electric Company and dean of American electrical inventors, was the recipient on his eighty-second birthday, March 29, of the Grashof memorial medal of honor from the Verein Deutscher Ingenieure in commemoration of his many contributions to engineering, invention and scientific research. The medal was presented at a luncheon at the Ritz-Carlton Hotel, Boston, following a meeting of the board of directors, and was conveyed by Herr Kurt von Tippelskirch, German Consul-General at Boston, to E. W. Rice, Jr., honorary chairman of the board, who represented Professor Thomson. The medalist is still confined to his home in Swampscott, Mass., as the result of illness, but sent a message of appreciation of the honor, which was read by Dr. Rice. Owen D. Young, chairman of the General Electric board, presided.

In awarding the medal Herr von Tippelskirch, touching upon the great human qualities of the recipient, expressed "the hope that Dr. Thomson may live and remain for many years to come a shining example, not only of the mastery of the forces of nature for the benefit of mankind but also of the true virtues of man."

On behalf of Professor Thomson, Dr. Rice deprecated the trend toward sinking into a narrow nationalistic viewpoint, with its diverse dangers, and voiced the significance of the award as an index of the unselfish and brotherly spirit of scientific workers without regard to national boundaries. Gerard Swope, president of the General Electric Company, then expressed the good fortune of that organization in having Professor Thomson's influence in its midst, his leadership having always been characterized by modesty, nobility of character and youthful viewpoint. Coincidently with the Boston gathering, a luncheon was held in Berlin by the V.D.I., which was host to many prominent engineers in honor of the occasion. Only one American, the late Calvin W. Rice, has received this medal.

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► James H. Critchett, vice-president of the Union Carbide & Carbon Research Laboratories, Inc., New York, has been elected president of the Electrochemical Society, Inc.

► W. L. Frost, vice-president in charge of sales of the Southern California Edison Company, has been elected a director to succeed C. A. Buffum, who resigned on account of poor health. Mr. Buffum had been a member of the board since 1933.

E. W. Rice, Jr., receiving medal for Prof. Elihu Thomson from Consul-General Baron Kurt von Tippelskirch

Left to right—Philip Stockton, Owen D. Young, Baron von Tippelskirch, George Peabody Gardner, E. W. Rice, Jr., Gordon Abbott, Francis L. Higginson, Gerard Swope and Thomas S. Knight.

OBITUARY

C. G. Adsit

Charles G. Adsit, formerly vice-president and chief engineer of the Georgia Power Company, Atlanta, died in Des Moines, Iowa, March 27, of a heart attack. Mr. Adsit had relinquished his connection with the Atlanta utility in 1927 and at the time of his death was president of the Des Moines Railway.

Mr. Adsit was born in Ironton, Ohio, 60 years ago. He was educated at the University of Chicago and served three years as an apprentice with the General Electric Company. After extensive engineering experience in the western part of the United States, in South America and Mexico, he transferred his interests in 1911 to Atlanta, where he became closely identified with every big engineering task undertaken by the Georgia Power Company and its predecessor, the Georgia Railway & Power Company. He resigned as vice-president and consulting engineer to establish a private consulting practice with offices in Atlanta, subsequently assuming the duties of president of the Des Moines Railway.

•

Bowen Tufts

Bowen Tufts, vice-president and general manager of C. D. Parker & Company, Inc., Boston investment bankers, a former president of the New England division of the National Electric Light Association, and for many years executive manager of a group of central stations affiliated with the Massachusetts Utilities Associates, lost his life by inhaling carbon monoxide gas at his home in Winchester, Mass., April 7. Mr. Tufts was born in Lexington, Mass., in 1884. He entered the banking field in 1899 and in 1906 became manager of C. D. Parker & Company, which expanded until in 1923 it was actively identified with the management of 46 electric and gas companies, over twelve ice companies and fourteen realty enterprises. Later the electric and gas utilities, which were operated virtually under Mr. Tuft's personal direction, were taken over by the New England Power Association. He was a director or trustee of 48 corporations.

•

► C. L. S. Tingley, head of the real estate department of the American Gas & Electric Company, New York, died, of a heart attack, April 5 at his office. He was 71 years of age. For more than 25 years Mr. Tingley had been with that company and the American Electric Power Company of Philadelphia, which

were consolidated in 1926. He had been a vice-president of American Electric Power. Mr. Tingley was a former president of the American Electric Railway Accountants' Association and a vice-president of the New Jersey Utilities Association.

▶ JOEL S. COFFIN, chairman of the executive committee and a director of the Superheater Company, New York, died March 11.

▶ GUY S. FELT, vice-president of the Hygrade Sylvania Corporation, Salem, Mass., died at Emporium, Pa., on March 8, after a short illness. He was born in that place 53 years ago and had been with the company since 1918.

▶ JOHN E. DONOGHUE, managing director Electric Light & Power Supply Corporation, Sydney, Australia, died December 28. A native of Sheffield, England, Mr. Donoghue had been connected with the electrical industry in Australia since 1902. In addition to his duties with this company he served as a consulting engineer for various municipal power plants. Mr. Donoghue was a member of the A.I.E.E.

▶ CAPT. WALTER M. MCFARLAND, U.S.N., retired, for twenty years manager of the marine department of the Babcock & Wilcox Company, New York, from active service in which he retired in 1931, died at his home in Washington, D. C., March 4, after a brief illness. He was 76 years of age. A graduate of the U. S. Naval Academy, Mr. McFarland resigned from the service in 1899 to accept a vice-presidency with the Westinghouse Electric & Manufacturing Company, where he supervised many large contracts and the company's publicity work. Eleven years later he resigned from this executive position to return to the marine engineering field with the Babcock & Wilcox Company.

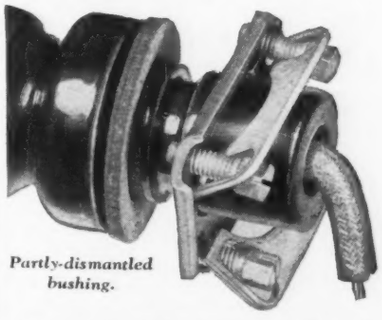
▶ KENNETH A. REED, chief engineer of the electrical division of the Hartford Steam Boiler Inspection & Insurance Company's engineering department, died March 23, at his home in Hartford, in his fifty-third year. Mr. Reed was prominently identified with national engineering societies and trade organizations. He joined the Hartford Steam Boiler Inspection & Insurance Company in 1921 to lay the groundwork on which, two years later, the company expanded its service to include the inspection and insurance of electrical machinery. Prior to 1921 he was connected with the Allis-Chalmers Manufacturing Company, Northwest Light & Water Company of North Yakima, Wash., the Westinghouse Electric & Manufacturing Company and the Interborough Rapid Transit Company of New York. Mr. Reed was active in committee work of the American Institute of Electrical Engineers and of the National Electric Light Association.

ECONOMIZE with Wagner STUD-BUSHING TYPE TRANSFORMERS

Stud-Bushing Type Transformer.

Wagner Stud-Bushing Type Transformers reduce maintenance and installation costs. Over a period of years, stud-bushing type transformers have proved to be more economical in operation than the ordinary type of transformers with cable-lead entrance . . . . Wagner stud-bushing type transformers are equipped with a type of bushing that can be removed quickly and easily—without fuss—and without lowering the transformers from platform or poles.

Some of the benefits derived from the use of stud-bushing type transformer over the customary lead-type are:



Partly-dismantled bushing.

(1) A reduction of installation costs since no soldering is necessary for connecting the transformer to the line.

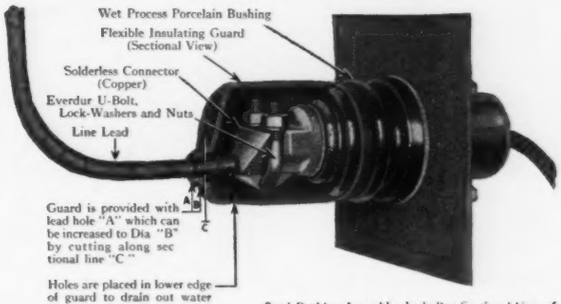
(2) No replacement of leads is necessary when the transformers are moved—or are damaged in handling—or due to the deterioration in service.

(3) No trouble due to syphoning of oil.

(4) A porcelain bushing designed with a definite flashover valve that will remain constant.

An ingeniously-designed clamp holds the bushing firmly in position, yet it can be quickly loosened and slipped off to remove the bushing. The bushing clamping assembly consists of two clamps, a retainer and four set screws. The two clamps engage a groove in the bushing and are held inside the retainer when pressure is applied on the set-screws against the tank wall. The pressure exerted by screws keep the assembly rigidly in place and also assures an oil tight joint by compressing the gasket between the shoulder on the bushing and the tank wall.

Stud-Bushing Type Transformers are fully discussed in Wagner Bulletin 172, Part 4D. Ask for copies.


Wet Process Porcelain Bushing
Flexible Insulating Guard (Sectional View)
Solderless Connector (Copper)
Everdur U-Bolt, Lock-Washers and Nuts
Line Lead
Guard is provided with lead hole "A" which can be increased to Dia "B" by cutting along sectional line "C"
Holes are placed in lower edge of guard to drain out water that may come in along the line lead.

Stud Bushing Assembly, Including Sectional View of Flexible Insulating Guard

Wagner Electric Corporation

6400 Plymouth Avenue, Saint Louis, U.S.A.

MOTORS TRANSFORMERS FANS BRAKES

T335-1

NEW EQUIPMENT

Compact Lamp Base and Cap

Base and cap for use with the new "Lumline" lamp have been announced by the General Electric Company's merchandise department, Bridgeport, Conn. This combination makes possible a wide variety of applications in the lighting of side wall and ceiling fixtures, store counters, window displays, etc.

General Electric

The base, because of its small size (⅝ x 1⅜ x ⅛ in.), permits the maximum light from the lamp to reach the surroundings, it is claimed. The cap, besides serving as a rigid holder for the lamp, provides all electrical contacts.

•

Appearance Featured in Ironing Machines

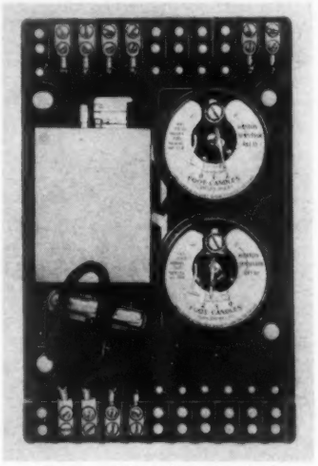
The new 1935 line of Apex standard and de luxe ironers, featuring neat, compact, box-type construction; removable cabinet covering ironer when not in use; exclusive fixed shoe; movable roll arrangement; knee and fingertip control, and an improved pressing feature with separate lever has been announced by the Apex Rotarex Corporation, Cleveland. Other features include safety shoe release, motor and heat control within easy reach, thermostatically controlled heat, collapsible end shelf and an extended base to provide stability when the cabinet top is in the dropped position. Models are decorated in green and black.

Apex Rotarex Corp.

•

Photronic Relay Controls Lights

Illumination control relay for both indoor and outdoor use has been announced by the Weston Electrical Instrument Corporation, Newark, N. J. This relay turns lights off and on automatically, maintaining a predetermined level of illumination. Operation of the device depends upon the intensity of the natural light available. A photronic cell used as the control element of the relay turns light on when the natural light intensity is insufficient for indoor or outdoor conditions. When the light is restored to adequate levels the lights are automatically turned off, eliminating waste.



Weston Electrical Inst. Corp.

•

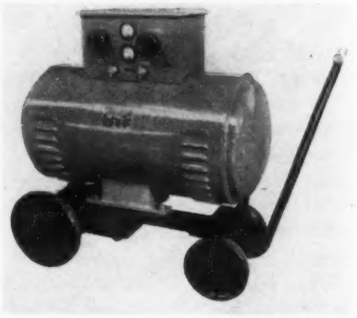
Cabinet Type Meter Panel

A cabinet type steel meter panel, equipped with doors to protect and conceal meter and control connections, is now being offered by the Bailey Meter Company, Cleveland, Ohio.

Paneled doors provided with a three-point locking mechanism and substantial cylinder locks prevent unauthorized access to electrical connections. These panels, made of one-piece sheet steel plate, are finished in black. Self-supporting construction facilitates installation.

Portable Arc Welder

Ideal Electric & Manufacturing Company, Mansfield, Ohio, has announced an arc welder featuring unity-power-factor motor drive and 10 to 15 per cent better over-all efficiency than conventional machines and with recovery from short circuit to normal welding current, which is about 30 times the speed of conventional recovery.



Ideal Electric

Both 25- and 40-volt operation is provided in the new welders. This permits the use of the new high-speed coated rod, as well as standard uncoated rod, and allows copper arc and carbon electrode work on the same machine.

•

Economy Featured in Blueprinting Machine

A blueprint machine which utilizes the new Angstrom incandescent blueprint lamps has been announced by the Milligan & Wright Company, Cleveland. Model 100 (shown) is a portable type which will make one 18 x 24, two 12 x 18 or four 9 x 12-in. prints at one time. A

Milligan & Wright

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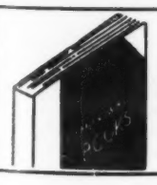

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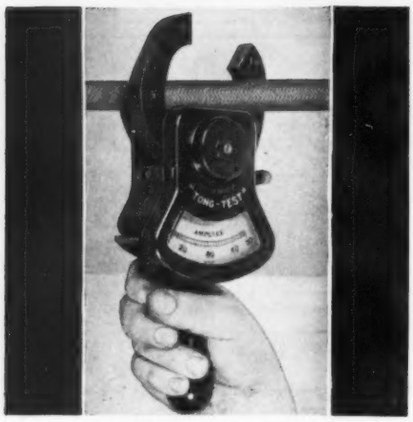

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The answer is simple. Tong Test is accurate to within 2% on A.C. and 4% on D.C. readings and, with ordinary care, will retain this accuracy indefinitely. There are no windings nor delicate mechanisms to get out of order.

Tong Test Ammeters are sturdily and finely made; they are absolutely safe, and they will make any reading in less than five seconds. You simply slip the tongs around the "hot" current conductor and read the meter.

Tong Tests are made in the following sizes; the movement units of each size are instantly interchangeable:

TYPE	STANDARD RANGES
A	50, 100, 150, 200
B	75, 100, 200, 300, 400
C	75, 100, 200, 300, 400, 600, 800
D	100, 200, 300, 400, 600, 800
AX	50, 200, 400

The Tong Test Bulletin, containing a complete description of these instruments, will be mailed promptly, on request.

TONG TEST AMMETERS

The Columbia Electric Mfg. Co.
4529 Hamilton Ave., Cleveland, Ohio

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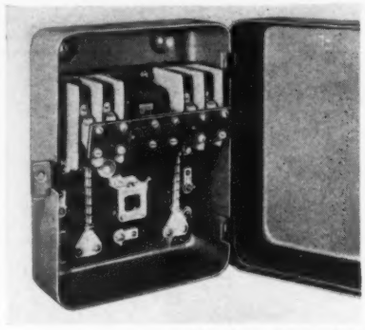
time switch shuts off the printer at the end of the desired exposure period. The print can then be removed, washed and dried on a special drying board furnished with the machine. The operating cost is 2¾ cents for making one 18 x 24-in. print. One print can be made as economically as a dozen, it is claimed.

•

Across-the-Line Starters

Across-the-line starters for use with squirrel-cage motors, or as primary contactor for wound-rotor motors, in conjunction with secondary rheostats, have been announced by the Monitor Controller Company, Baltimore, Md. Featured in the design are automatic reset overload, manual reset overload from button in the cover, start-and-stop button, hand-off-automatic switch and reset button in the cover, fusible or unfused disconnect switch.

The thermal overload relay (lower portion of illustration), an integral part of all starters, is compensated so that wide variations in ambient temperatures do not affect the operating characteristics. Thus positive protection is provided at all times. Rating of the relay can be changed by inserting proper heating elements to handle any load conditions within the range of the starter.



Monitor Controller

•

New Miniature Instruments

A line of direct-current, radio-frequency and "Rectox" miniature instruments designed for radio and communication equipment has been announced by the Westinghouse Electric & Manufacturing Company. The RX instruments have a scale length of 2.4 in. and are said to be accurate within two per cent (Rectox types five per cent). Flange dimensions measure 3x3⅛ in. with zero adjustment on the outside.

Rectox instruments are adapted to the measurement of alternating currents when low energy consumption is necessary, it is stated. A copper-oxide full-wave rectifier is mounted inside the instrument case and is connected to feed full-wave rectified current to the moving coil.

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ENGINEERING DATA FROM MANUFACTURERS

Bulletins and catalogs now available to engineers by manufacturers and associations

Additional information for Bulletin B-1, dealing with tensile properties and resistance to solvents of Thiokol B, has been issued by the Thiokol Corporation, Yardville, N. J.

Binks Manufacturing Company, 3106 Carroll Ave., Chicago, Ill., offers an 8-page bulletin on indoor forced-draft spray-cooling towers presenting complete information about constructional features, picturing a number of installations, showing typical arrangements and giving size and capacity data and specifications. A similar bulletin is devoted to atmospheric spray-cooling towers for air conditioning and refrigeration.

Operation, ratings and specifications of air-break switches are covered in a bulletin 39-B recently issued by the Delta-Star Electric Company, 2400 Block, Fulton Street, Chicago.

"Sylvania Technical Manual" has been brought up to date by the addition of characteristics and technical data on two recently announced tubes, types 6A6 and 83V, as announced by the Hygrade Sylvania Corporation, 500 Fifth Avenue, New York City.

Details of design and the method of operation are presented in a recent bulletin describing the Hays "Draftrol" gage, manufactured by the Hays Corporation, Michigan City, Ind. These pages are used for indicating and controlling draft, pressure and flow of gas or air.

Operation and construction details and principles, specifications and features of watt-hour-demand meters, contact-operated meters, totalizing relays, thermal meters, contact and testing devices are detailed in a 55-page bulletin, GEA-612B, published by the General Electric Company.

Benjamin Electric Manufacturing Company, Des Plaines, Ill., has announced its "Six Point Program for Effective Lighting of Industrial Plants." This program, as issued, points out where inadequacies and waste occur in the lighting system and outlines methods for checking and correcting these faults.

A pamphlet has been announced by the Electric Storage Battery Company, Nineteenth Street and Alleghany Avenue, Philadelphia, describing the operation of its float meter for determination of the voltage maintained at floated batteries.

Copies of the 1934 *Proceedings* of the A.S.T.M. are now available from the society headquarters, 260 S. Broad Street, Philadelphia, for $5.50 each. Part I gives the reports of the standing committees, together with the new and revised tentative specifications; Part II deals with the technical papers presented.

Bulletin 1010, issued by the Appleton Electric Company, 1701 Wellington Avenue, Chicago, Ill., gives structural and application features of its line of dead-end circuit breaking plugs and receptacles.

A preliminary report of the electrical machinery committee of the A.I.E.E., giving proposed test code for polyphase induction machines, has been announced. Copies may be obtained from the institute at 33 West Thirty-ninth Street, New York City.

Tennessee Eastman Corporation, Kingsport, Tenn., has announced a 16-page bulletin dealing with various phases of wood deterioration and its prevention.

WHY...

this Varnished Tape meets exacting specs

POWER COMPANIES and electrical manufacturers who must have varnished tape of exceptionally high quality have found in Empire Varnished Tape the answer to their needs.

Why? Because this tape to an unusual degree possesses almost any *combination* of varnished tape characteristics desired. It meets exacting requirements as to dielectric strength, tensile breaking strength, elongation, pliability, finish, uniformity, resistance to aging, and resistance to the severe conditions encountered in making joints and splices.

We would welcome an opportunity to send you samples for test. Empire Varnished Insulation is available in yellow or black, straight or seamless bias cut, in tape form or in full width materials.

Mica Insulator Company, 200 Varick Street, New York, N. Y.; 542 South Dearborn Street, Chicago, Ill; 1330 Schofield Building, Cleveland, O.; *Branches at* Birmingham, Boston, Cincinnati, Los Angeles, San Francisco, Seattle. *Canada:* Montreal, Quebec; Toronto, Ontario

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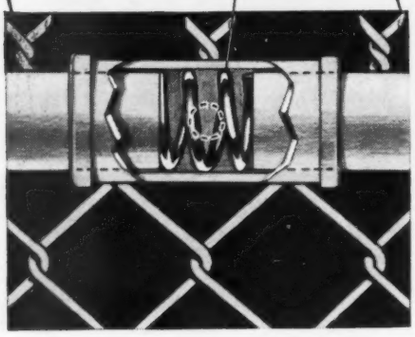
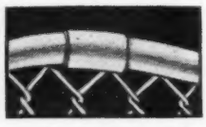
why a Cyclone fence stays straight



The Cyclone Way A sturdy expansion coupling with enclosed heavy spring compensates for expansion and contraction. No breakage or bending. Fence stays straight.

The Ordinary Way Rigid coupling cannot allow for expansion and contraction of rails. Posts are displaced, rails broken or bent.



● Top rail actually pulled apart as the metal contracts with the cold — top rail with "waves" in it caused as the metal expands with the heat! Huge repair bills and an unsightly fence. Guard against its happening to *your* fence by insisting on genuine "Cyclone," for Cyclone's special coupling protects against effects of changing temperature.

This is but *one* of the features which protect Cyclone Fence owners from repair bills and inconvenience.

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Cyclone Fence
Cyclone is not a "type" of fence, but is fence made exclusively by Cyclone Fence Company and identified by this trade mark
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Recent Rate Changes

Duquesne Light Company has offered to reduce its rates $1,281,000 annually, effective May 1. As a result the Public Service Commission has dismissed its complaint against the company. The bulk of the reduction will be on the bills of small consumers. Approximately $620,000 annual saving will accrue to residential consumers and $420,000 to commercial consumers.

•

Massachusetts Department of Public Utilities has sanctioned Governor Curley's drive for utility rate reductions, announcing approval of 45 lowered rate schedules, involving an estimated total saving to consumers throughout the state of $2,000,000 annually. Of all the schedules going into effect the largest saving will be that of $750,000 to the customers of the Edison Electric Illuminating Company of Boston. Among the companies reducing rates are Cambridge Electric Light, Quincy Electric Light & Power, Weymouth Light & Power, Plymouth Electric Light, Beverly Gas & Electric, Gloucester Electric, Malden Electric, Lynn Gas & Electric, Edison Electric Illuminating of Brockton, Worcester Suburban Electric, Worcester Electric Light, Fall River Electric Light and Southeastern Massachusetts Power & Electric.

•

Potomac Edison Company has notified the Maryland Public Service Commission that it accepts the terms of an order handed down by the commission setting electric rates (ELECTRICAL WORLD, March 16, page 72).

•

Georgia Public Service Commission has issued a rule nisi, citing the power companies to show cause why their commercial schedules should not be reduced.

•

Birmingham Electric Company has set up a new schedule of rates, granting residential and commercial consumers a 50 per cent reduction in the cost of power used in excess of the consumption recorded for each customer in the corresponding month of 1934. The new rates were effective April 1, subject to the approval of the State Commission. The most important feature of the new schedule is the "Majority Rule" phase under which an automatic decrease in the minimum rate is given as the general average consumption goes up. When the residential electric customers, encouraged by the 50 per cent discount for extra electricity used, increase their use of electricity to the point where 50 per cent of residential bills for 12 months have been for 30 kw.-hrs. or more, then the top rate drops to 6 cents per kilowatt-hour. As the increase in use continues, for each five kilowatt-hours per

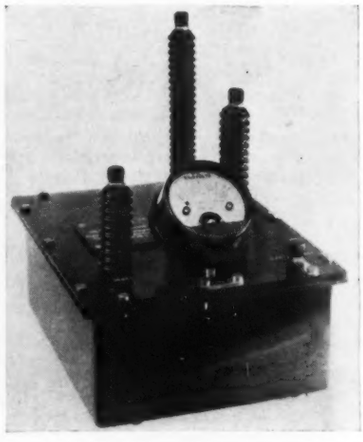
A NEW ELECTROSTATIC VOLTMETER

Long-felt Need Now Met

Ferranti Electric, Inc., New York, now offers an electrostatic voltmeter with scale up to 18,000 volts maximum, in single, dual and triple range types. In addition to these high-range instruments, electrostatic voltmeters are announced with scales up to 3,500 volts.

Outstanding features may be summarized as follows:

1. **No current consumption**
2. **Magnetic Damping**
3. **150 to 18,000 Volts**
4. **Self-contained over-voltage protection**
5. **Flush, Projecting, Portable and Desk Types**
6. **2½", 3½" and 4" Dials**



Ferranti Electrostatic Voltmeters are available in eleven standard ranges up to 3,500 volts, in 2½" dust-proof molded bakelite cases.

Single, dual and triple-range voltmeters can be supplied with full scales up to 18,000 volts. These voltmeters consist of a standard 2½" projecting type instrument mounted upon a condenser potential divider which is fitted in a compound-filled case. This case is covered by a bakelite panel on which the high voltage terminals and the instrument are mounted as shown by the illustration above. Dimensions are approximately 8" x 10" x 10" over the high voltage terminals.

Complete information regarding Ferranti Electrostatic Voltmeters will be furnished promptly on request.

FERRANTI ELECTRIC, Inc.
130 W. 42nd Street New York City

FERRANTI ELECTRIC, Ltd., Toronto, Can.
FERRANTI, Ltd., Hollinwood, England

bill added to the above figure, an additional reduction of one-half cent will be made in the top rate until the low top rate of 3.9 cents is reached. Fifty-one per cent of the customers' bills for the last 12 months were for 25 kw.-hrs.

•

Public Service Electric & Gas Company and the New Jersey Board of Public Utility Commissioners failed to reach an agreement on an immediate reduction in electric rates at recent conferences. The maximum reduction proposed by the company was $3,250,000, according to a statement made by Harry Bacharach, president of the commission. The board would not accept this offer. John A. Matthews, counsel for the petitioners in the rate reduction case, issued a statement contending the company should make an immediate reduction of $6,000,000 in its annual bill. A decision by the commission is expected next week.

•

Toledo Edison Company officials have turned down the demand of the City Council's special rate committee and the legislators refused to consider the company's compromise offer. The committee had demanded a 22 per cent reduction in the domestic rate and a 20 per cent cut in the city's street lighting rate. C. L. Proctor, general manager of the company, offered a 10 per cent reduction in the domestic rate and reiterated his former offer of a 10 per cent reduction in the residential street lighting rate and a 15 per cent reduction in the white-way lighting costs.

•

Washington State Supreme Court has ruled that public utility rate reductions cannot be ordered by the State Public Service Department without property valuations. The ruling sustained a Thurston County Superior Court decision, reversing a departmental order reducing Puget Sound Power & Light Company rates in Port Angeles $25,000 a year.

•

California State Railroad Commission has approved the schedule for reduced electric rates filed by the San Joaquin Light & Power Corporation and the Midland Counties Public Service Corporation, subsidiaries of the Pacific Gas & Electric Company. The new sliding scale will enable domestic lighting consumers residing in incorporated cities served by the company to enjoy substantially lower rates in direct proportion to their consumption. As outlined, the scale provides a rate of 4.5 cents per kilowatt-hour for the first 30 hours and slides to a minimum of 1.5 cents.

•

Virginia State Corporation Commission has denied the motion of the Virginia Coal Operators' Association for an immediate 12½ per cent cut in the power rates of the Old Dominion Power Company.

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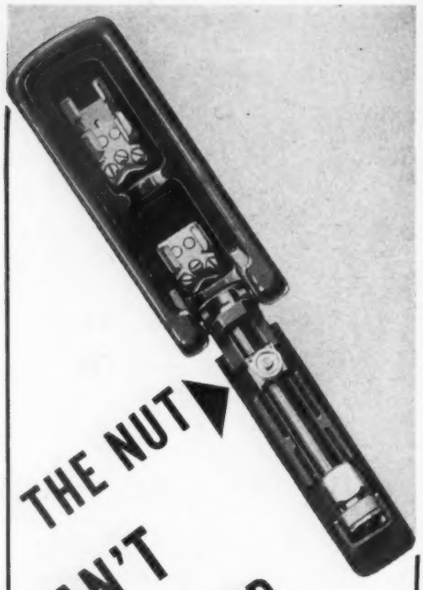

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3 Circuit disconnects when door is opened.

4 Fuse tube removed safely and quickly. No tools.

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R 54008

ES cutouts

SALES OPPORTUNITIES IN NEW CONSTRUCTION

PLUMERVILLE, ARK.—Arkansas Power & Light Company, Pine Bluff, Ark., plans early construction of new transmission line from Plumerville to El Paso, Ark., about 40 miles, with power substation and distribution facilities in that district. Cost close to $155,000.

ALLENTOWN, PA.—J. E. Barbour-Allentown Corporation plans installation of motors and controls, conveyors and other equipment in new multi-story addition to jute yarn mill. Cost about $200,000. Charles T. Main, Inc., 201 Devonshire Street, Boston, Mass., is consulting engineer.

RALEIGH, N. C. — Carolina Power & Light Company, Raleigh, plans extensions in transmission and distributing lines from Olanta to New Zion, Turbeville, Sardinia and vicinity, about 25 miles; also from Timmonsville to Sardis, about 10 miles. Cost over $85,000, with power substation facilities for rural service in districts noted.

BELLEVILLE, ILL. — Quartermaster, United States Army, Scott Field, Belleville, receives bids until April 26 for installation of night lighting system (Circular 14).

BALTIMORE, MD.—Chesapeake & Potomac Telephone Company plans construction of about 80 miles of new aerial stormproof cable at Baltimore and in Eastern Shore district, requiring about 5,000 new poles, 1,700 miles of open wire, cross-arms, fittings, etc. Work will be carried out as part of 1935 expansion and improvement program to cost about $690,000.

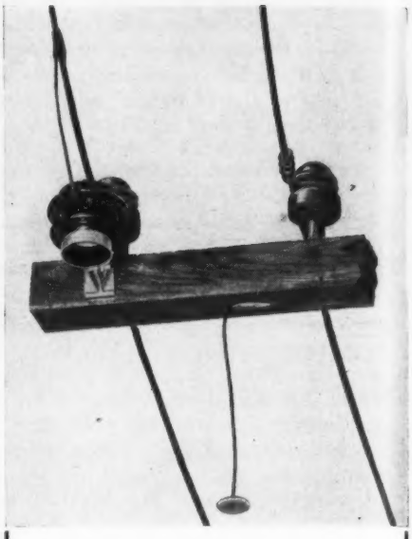
CARTERET, N. J.—Public Service Electric & Gas Company, Newark, N. J., plans installation of underground conduit system in business district and removal of present overhead lines. Agreement has been made with city for improvement.

McCOOK, ILL.—Electro-Motive Corporation, affiliated with Winton Engine Company, Cleveland, Ohio (both subsidiaries of General Motors Corporation, New York, N. Y.), has acquired 70-acre tract of land near McCook, for new plant for Diesel-electric locomotive manufacture, recently referred to in these columns. Will install transformers and other power substation equipment, heavy-duty motors and controls, conveyors, one 200-ton and two 30-ton electric traveling cranes, electric hoists and other equipment in group of nine buildings. Work scheduled to begin soon. Cost about $600,000. Austin Company, Cleveland, Ohio, is engineer and contractor.

NAPA, CALIF.—Is considering new city-owned electric light and power plant, using Diesel engine-generator units, and electrical distribution system. Report has been submitted by George B. Scheer, San Francisco, engineer, with estimated cost at $340,000.

DENVER, COLO.—Bureau of Reclamation asks bids until April 27 for 104 luminaries for illumination of main roadway over Boulder Dam, Boulder Canyon Project, Arizona - California - Nevada, and for 34 luminaries for roadways connecting dam and intake towers (Specification 674-D); also, until April 18 for one 180-ton transfer car for power plant, same project (Specification 673-D).

RICHMOND, VA. — Virginia Electric & Power Company, Richmond, is arranging fund of about $1,500,000 for extensions and improvements in power plants and system during 1935, including power station betterments to cost about $100,000; extensions in transmission and distribution lines for service to new customers, $500,000; pole



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R 54004

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New LV ARRESTERS

replacements on present lines, $90,000; extensions in power substations, $115,000; reconstruction and improvements in street-lighting system, $50,000, and other work.

MEADVILLE, PA. — Hookless Fastener Company plans installation of motors and controls, regulators, conveyors and other equipment in new multi-story plant addition, for which bids will be asked soon on general building contract. Cost about $350,000. Wilbur Watson & Associates, 4614 Prospect Avenue, Cleveland, Ohio, are architects.

BOSTON, MASS.—Bureau of Yards and Docks, Navy Department, Washington, D. C., asks bids (no closing date stated) for two steel radio towers for Boston Navy Yard (Specification 7907).

WINTHROP, ME.—Bonifide Mills, Inc., Winthrop, with main offices at 34 Thirty-fourth Street, Brooklyn, N. Y., plans installation of motors and controls, conveyors, etc., in four new one- and multi-story additions to composition floor-covering manufacturing plant at Winthrop. Cost about $160,000.

NEWARK, N. J. — George C. Bergen, County Purchasing Agent, Room 521, Hall of Records, receives bids until April 16 for one year's supply of incandescent electric lamps for various county institutions.

OWATONNA, MINN.—Plans extensions and improvements in city-owned power plant, with installation of additional equipment. Cost about $70,000. Frank Snyder is plant superintendent, in charge.

ANNAPOLIS, MD.—Bureau of Yards and Docks, Navy Department, Washington, D. C., is asking bids (no closing date stated) for converting d.c. equipment at Naval Academy, Annapolis, for operation on a.c. current (Specification 7921).

SEATTLE, WASH. — Century Brewing Company has approved plans for new multi-story addition. Cost about $100 000. W. H. Witt Company, Lloyd Building, is consulting engineer.

SHAWNEE, OKLA.—Plans call for bids in May for new Diesel engine-generator set and auxiliary equipment for standby service at city-owned power plant. W. R. Holway, 302 East Eighteenth Street, Tulsa, Okla., is consulting engineer.

WASHINGTON, D. C.—Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until April 19 for 840 electric ventilating fans and spare parts for Brooklyn, N. Y., and Mare Island, Calif., Navy Yards (Schedule 4693); also, at same time, for 410 tumbler-type switches and seven enclosed lever-type switches for Brooklyn, N. Y., and Charleston, S. C., Navy Yards (Schedule 4710).

ROARING RIVER, N. C.—Roaring River Furniture Corporation plans installation of motors and controls, conveyors and other equipment in connection with rebuilding of plant recently destroyed by fire. Loss over $100,000.

GREENWOOD, S. C.—Board of Greenwood County Commissioners has let contract to General Electric Company, Schenectady, N. Y., for generator units, transformers and auxiliary equipment for new hydroelectric generating plant on Saluda River, near Buzzards Roost, and make award to Baldwin-Southwark Corporation, Philadelphia, Pa., for water wheels and hydraulic equipment, at $325,168 and $167,000, respectively. Bids will be asked soon for power dam, power house, spillway and other structures. Project will include construction of about 110 miles of transmission and distribution lines for service in different parts of Greenwood, Newberry and Laurens Counties. Fund of $2,627,000 has been secured through Federal aid. Daniel T. Duncan Engineering Company, Greenwood, is consulting engineer.

MOUNT MORRIS, ILL.—Has called special election on April 16 to approve construction of new city-owned electric light and power plant.

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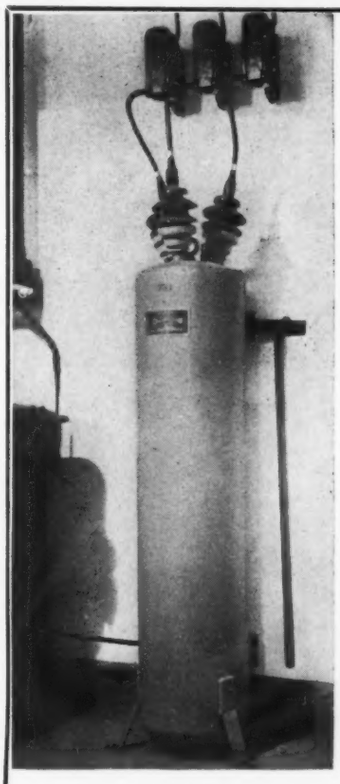

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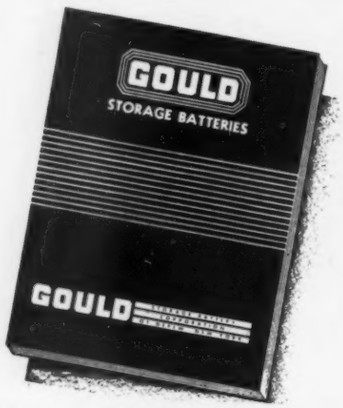

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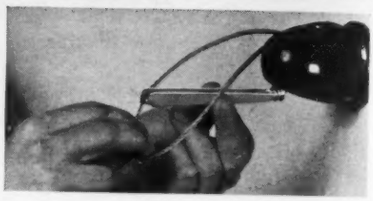
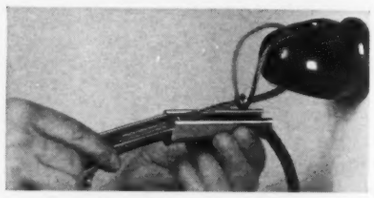
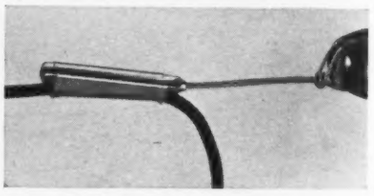


Attaching bail to fixture



Clamping shell to concentric cable



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